NUCLEAR PUBLIC INFORMATION AND RATIONAL PUBLIC POLICY DECISIONS

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY RESEARCH AND PRODUCTION

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

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CONTENTS

WITNESSES

Page

December 15, 1981:

Melvin Gottlieb, Director Emeritus, Princeton Plasma Physics Lab, Chairman-elect, Panel on Public Affairs, American Physical Society, Fellow in Science and Public Policy, Brookings Institution; and Lynn Weaver, Chairman, Coordinating Committee on Energy, American Association of Engineering Societies, Director of the School of Nuclear Engineering and Health Physics, Georgia Institute of Technology 4

Leonard J. Theberge, President, The Media Institute, and Robert L. DuPont, Clinical Professor of Psychiatry, Georgetown University Medical School; President, The Phobia Society of America 20

Robert C. Odle, Jr., Assistant Secretary for Congressional, Intergovernmental and Public Affairs, Department of Energy; and Shelby Brewer, Assistant Secretary for Nuclear Energy, Department of Energy 147

AFTERNOON SESSION

Gene Pokorny, President, Cambridge Reports, Inc. 175

APPENDIXES

I. Additional statements for the Record 185

Dr. Hans A. Bethe, Professor Emeritus, Cornell University and Consultant 185

Dr. Allen Brodsky 192

II. Additional Materials 201

"Syndromes of Risk and Environmental Protection: The Conflict of Individual and Societal Values," article by Miller B. Spangler, from *The Environmental Professional*, Volume 2, 1980 201

"Societal Aversion to Catastrophic and Involuntary Risks of Nuclear Power," summary of an invited paper to be presented by Miller B. Spangler at the 1982 Annual Meeting of the American Nuclear Society, June 6-11, 1982 219

"The Role of Interdisciplinary Analysis in Bridging the Gap Between the Technical and Human Sides of Risk Assessment," article by Miller B. Spangler, to be published in a forthcoming issue of *Risk Analysis: An International Journal* 225

"Nuclear Power: Epilogue or Prologue," article by Harold R. Denton, to be published in *The Energy Journal*, July 1982 246

III. Questions and answers for the Record 267

NUCLEAR PUBLIC INFORMATION AND RATIONAL PUBLIC POLICY DECISIONS

TUESDAY, DECEMBER 15, 1981

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON ENERGY RESEARCH AND PRODUCTION,
Washington, D.C.

The Subcommittee met, pursuant to call, at 9:30 a.m., in room 2325, Rayburn House Office Building, Hon. Marilyn Lloyd Bouquard (Chairman of the Subcommittee) presiding.

Mrs. BOUQUARD. The Subcommittee will come to order.

I would like to ask unanimous consent that the film crew be permitted to televise the hearing.

Good morning.

A debate over the subject of nuclear energy appears to have become a fact of modern life. Debate is often a normal and essential part of a larger discussion. Unfortunately, in the case of nuclear energy, the public debate is not only highly polarized and emotional, but has been terribly confusing from the citizen's viewpoint.

Today's hearings are not designed to provide yet another forum to engage in the debate over just how much nuclear energy this country should use, or about its relative risks and benefits, or about its economics, or indeed even about this current administration's policy directives in this arena. Rather, we intend this to be a forum to address one critical ingredient in the nuclear debate that is too often overlooked; that is, the information available to the public and, in particular, the public educational information available from the Department of Energy on its nuclear programs.

I believe we must also consider the issue of relative balance in DOE's information programs for various energy sources, including coal and alternative sources.

It has been apparent to me for some time that the concerned citizen is often confused or misinformed about many aspects of nuclear energy. Clearly, confusion and misinformation are not characteristics solely of the nuclear debate but are endemic to many of the issues that citizens, legislators, and scientists face in the modern world.

Nonetheless, it is of particular concern to this Subcommittee that so little attention appears to have been paid to the nature and consequences of distorted debate and rhetoric about such things as nuclear energy. Indeed, it is ironic that one of the most succinct ob-

servations about this has been made from behind the Iron Curtain by the exiled Soviet Nobel Peace Prize winner, Andrei Sakharov.

> There has been public discussion of topics related to scientific progress—nuclear power; the population explosion; genetic engineering; regulation of industry to protect the environment; protection of air quality, of flora and fauna, and of rivers, lakes, seas, and oceans; the impact of mass media. Unfortunately, despite the urgent and serious nature of the issues at stake, such discussions are often uninformed, prejudiced or politicized, and sometimes simply dishonest.
>
> The discussion of nuclear power, a subject of prime importance, is an instructive example. I have expressed elsewhere my opinion that the dangers of nuclear power have been exaggerated in the West, and that such distortion is harmful.

The purpose of this hearing, then, in brief, is to examine the nature, quality, and impact of public information on an issue so important and, as Dr. Sakharov pointed out, so "instructive."

Also, I believe we should pursue the question as to what constitutes a balanced public information program for the DOE.

Even aside from Dr. Sakharov's observations, the justification for a somewhat narrow look at the nuclear aspect of this broader problem of public communication of complex scientific issues can be arrived at by making a few, simple observations that are essentially unrelated to advocacy for or the debate about nuclear energy.

First, if this Nation completes and the Nuclear Regulatory Commission licenses the nuclear generating stations now under construction, we will in less than a decade have more than doubled the nuclear share of U.S. electric generation.

Second, there exists a significant volume of radioactive waste that must be ultimately safely disposed of. It seems clear that the Congress will shortly arrive at legislation that will finally, along with the President's strong initiative, provide a decision to proceed.

Third, the public wants to know more about nuclear energy.

These three observations indicate clearly the need for more and better information about all aspects of nuclear energy.

With regard to the public's interest in nuclear energy and the need for more balanced, accurate, and understandable information for nontechnical people, it seems clear that important participants in the public discussion are the taxpayer supported Department of Energy's public affairs and nuclear energy research programs. I am particularly concerned that the nuclear side of the Department of Energy has not been an active participant in recent years and that so far this year, under a new administration, there is still no evidence that there will be any degree of active participation, in spite of some rhetoric to the contrary.

Before the panels of distinguished witnesses address this narrow issue and the broader one of the problems, needs, and perspectives on public information in this arena, I would like to close with a quote to set the tone of the discussions I hope will take place today. The quote comes from Dr. June Goodfield, a senior research associate at the Rockefeller University, who has recently published a book called Reflections on Science and the Media:

> The reasons for communicating science to the public span a whole spectrum, from the value of education and culture to those of politics and government. In addition, even if it were not true that more and more people desire to influence decisionmaking processes, it would still be essential in a democratic society for them to be so involved.

Mrs. BOUQUARD. We are happy to have our witnesses here today with us. Our first panel includes Dr. Melvin Gottlieb, Director Emeritus of the Princeton Plasma Physics Lab. With him is Dr. Lynn Weaver, Chairman, Coordinating Committee on Energy, American Association of Engineering Societies and Director of the School of Nuclear Engineering and Health Physics, Georgia Institute of Technology.

We certainly welcome you gentlemen, and we look forward to your testimony. Thank you for being with us this morning.

Dr. Gottlieb?

STATEMENTS OF DR. MELVIN B. GOTTLIEB, DIRECTOR EMERITUS, PRINCETON PLASMA PHYSICS LAB, CHAIRMAN ELECT, PANEL ON PUBLIC AFFAIRS, AMERICAN PHYSICAL SOCIETY, FELLOW IN SCIENCE AND PUBLIC POLICY, BROOKINGS INSTITUTION; AND DR. LYNN E. WEAVER, CHAIRMAN, COORDINATING COMMITTEE ON ENERGY, AMERICAN ASSOCIATION OF ENGINEERING SOCIETIES AND DIRECTOR OF THE SCHOOL OF NUCLEAR ENGINEERING AND HEALTH PHYSICS, GEORGIA INSTITUTE OF TECHNOLOGY

Mrs. BOUQUARD. Mr. Gottlieb.

Dr. GOTTLIEB. Good morning.

I want to thank you, Madam Chairman, for inviting me to address this meeting. My name is Melvin B. Gottlieb, Director Emeritus of the Princeton Plasma Physics Lab. I am at the moment a Science Fellow at the Brookings Institute, and also Chairman Elect of Public Affairs of the American Physical Society, which is the professional organization of physicists.

I am also a board member of the Americans for Energy Independence. Dr. Hans Bethe, who is the Chairman of the Board of Americans for Energy Independence, had hoped to come, but unfortunately his appendix decided otherwise, so he was unable to be here. I understand he has sent a copy of his remarks to the committee.

Mrs. BOUQUARD. We certainly wish he could be with us today. We wish him a speedy recovery. We are happy that you and Dr. Weaver can be here.

Dr. GOTTLIEB. Thank you.

I have been working in fusion energy for well over 25 years. Back in 1958, when the U.S. fusion program was declassified, I decided to investigate the question of when fusion or other new energy sources would be needed.

To my surprise, I found that energy problems were likely to arise as early as the 1970's, due to leveling of domestic petroleum supplies. I have been lecturing on that subject since.

In the early days I would get as many as three people to come to this lecture, none of whom believed there were energy problems.

There is no single or simple solution to the problem. Certainly conservation, together with increased utilization of coal and nuclear energy, form important parts of the solution. Historically, electric energy consumption has grown much more rapidly than total energy consumption. That situation continues today.

In the first 6 months of 1981, as compared with the same period in 1980, real gross national product grew by 2.1 percent. Total energy use actually dropped 2.5 percent. However, electric energy use increased 1.3 percent, just a little bit less than the GNP increased. In other words, electricity is growing with GNP but at a slightly lower rate.

Over the next decade, present plans call for electric generating capacity to grow at the rate of about 3 percent per annum: about a third of the growth to be nuclear. We all look forward to renewed growth of our economy.

That growth could be stifled by an inadequate supply of electric energy. This is a particular concern in the light of present public attitude toward nuclear energy.

Nuclear energy, like so many other areas of science and technology, actually involves two broad areas of discussion.

First, there is the continuous discussion among experts about all manner of details relating to the safe and proper use of a technology.

Second, at least as important and certainly more visible is what I call the public discussion, the involvement of the citizens through the press, State, local, and Federal governments and other institutions.

Too often, though, with respect to nuclear energy, the public and expert discussion appear to be worlds apart. The fact that this is not a new phenomenon is made clear by a remarkably penetrating statement from Walter Lippmann's "The Public Philosophy," published more than 25 years ago.

> When the distant and unfamiliar and complex things are communicated to great masses of people, the truth suffers a considerable and often radical distortion. The complex is made over into the simple, the hypothetical into the dogmatic and the relative into an absolute.

The public discussion and debate surrounding nuclear energy is important for two fundamental reasons.

From a scientific perspective, it is clearly important that the best consensus of expert and well-considered judgment and knowledge to be used to help formulate public policy in so important an arena.

At the same time, it is also critical from the perspective of the scientific community that we find rational methods to engage with as little emotive rhetoric as possible in public discussions on this complex technology.

When public discussion becomes highly polarized and emotional, it results in fertile ground for the creation of misinformation and myth. This, in turn, contributes to antiscience and antitechnology sentiments.

For those of us engaged in both the science and the public discussion of energy technologies, it is frustrating to find that the public's impression of what the experts believe is often quite different from what the experts actually do believe.

For example, the public seems to believe that the technical community is fundamentally divided on the issue of the need for nuclear energy. Just months after the accident at Three Mile Island, when public support for nuclear energy was at its lowest ebb, a survey of members of the Institute of Electrical & Electronics Engineers found that 83 percent of those responding favored "the further development and use of nuclear power."

The IEEE is the world's largest and oldest professional engineering society with almost a quarter of a million members.

Another example can be found in discussion surrounding nuclear waste. The ability of this society safely to manage nuclear waste appears, at least from my experience and reading of the popular press, to be an issue of great concern, possibly the primary concern, of the public. The popular notion appears to be that there is no solution.

Some 4 years ago when, by the way, the techniques were not as well developed as they are today, the American Physical Society conducted an independent evaluation of the technical issues involved in nuclear waste management. The study encompassed a wide range of scientific and engineering viewpoints. The fundamental conclusion, published in January 1978:

> For all LWR fuel cycle options, safe and reliable management of nuclear wastes and control of radioactive effluents can be accomplished with technologies that either exist or involve straightforward extension of existing capabilities.

A multitude of examples of public confusion and misinformation can be found involving the subject of radiation. Ironically, the science of radiation and its effects on humans is one of the longest studied and best understood of all our environmental problems. Yet, it appears to be the most misunderstood and feared by the public.

The mythology that evolves around nuclear energy technology is a consequence of failures on the part of parties currently engaged in the discussion and of the lack of a full and proper involvement of certain communities and organizations.

Here I wish to emphasize the following points.

Clearly the Government agencies involved in commercial nuclear energy have a responsibility to be involved in the public arena in a manner appropriate to their individual missions—the EPA, for example, with respect to radiation emissions; the NRC with respect to the safety of operating facilities; and the Department of Energy with respect to its research and development programs.

Again, I repeat that is my fundamental message here. It is not a matter of choice. It is a matter of responsibility.

Mrs. BOUQUARD. Thank you.

Mr. GOTTLIEB. The existence of misunderstanding, concern, and fear is alone a sufficient justification for a proper and unbiased education of the public on almost any public issue. With respect to nuclear energy, the fact that almost one-fifth of the world's electricity will be derived from this source by 1985 makes this technology of sufficient national and international importance to require a greater public understanding.

The need for improved public information became abundantly clear to essentially every individual and organization that studied the Three Mile Island accident. President Carter's blue-ribbon panel on TMI, chaired by John Kemeny, called for greatly improved industry efforts in this regard, as well as a better educated press on the subject, and for improved information from Federal agencies, the same theme.

The NRC's own Rogovin Report made similar recommendations. The Report of the Governor's Commission for the State of Pennsylvania stated most accurately, "Nuclear energy education is imperative if the public is to gain a better understanding of the subject."

The steps needed to promote a better informed public are not unique to nuclear energy but may well serve as an example of our ability to discuss rationally this type of scientific/technical and social issue. The steps must involve:

One, a scientific/technical community willing and able to participate with the press, public, and government.

Two, an industry effort to continue to discuss its involvement and attempt to improve its credibility.

Three, a press willing and interested in being better informed on the subject.

Four, a government, in particular the Department of Energy, playing a proper role in informing the public on its programs.

Five, a public interested and willing to listen.

All of this will not in any way guarantee the health or survival of the nuclear industry, but without a proper involvement of all parties, it is virtually certain that decisions and choices will not be made on the best of evidence and fact.

The mix of the public's need, both for energy and information on its sources of energy, has been quite nicely summarized by Samuel Florman in his recently published book, "Blaming Technology: The Irrational Search for Scapegoats":

> The future of nuclear energy depends at least as much on human needs and human fears as upon technical considerations.

I completely agree with that statement.

Thank you, Madam Chairman.

[The prepared statement of Dr. Gottlieb follows:]

Testimony of M. B. Gottlieb

before the

House Committee on Science and Technology

December 15, 1981

I have been working in fusion energy for well over 25 years. Back in 1958 when the U.S. fusion program was declassified I decided to investigate the question of when fusion or other new energy sources would be needed. To my surprise I found that energy problems were likely to arise as early as the nineteen seventies -- due to levelling of domestic petroleum supplies. I have been lecturing on that subject since.

There is no single solution to the problem. Certainly conservation together with increased utilization of coal and nuclear energy form important parts of the solution.

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This is a particular concern in the light of present public concerns about nuclear energy.

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This, in turn, contributes to anti-science and anti-technology sentiments.

For those of us engaged in both the science and the public discussion of energy technologies, it is frustrating to find that the public's impression of what the experts believe is often quite different from what the experts actually do believe. For example, the public seems to believe that the technical community is fundamentally divided on the issue of the need for nuclear energy. Just months after the accident at Three Mile Island, when public support for nuclear energy was at its lowest ebb, a survey of members of the Institute of Electrical and Electronics Engineers (IEEE) found that 83 percent of those responding favored "the further development and use of nuclear power." The IEEE is the world's largest and oldest professional engineering society with almost a quarter of a million members.

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communities and organizations.

Clearly, the government agencies involved in commercial nuclear energy have a responsibility to be involved in the public arena in a manner appropriate to their individual missions: The EPA, for example, with respect to radiation emissions; the NRC with respect to the safety of operating facilities; and the Department of Energy with respect to its research and development programs.

The existence of misunderstanding, concern and fear is alone a sufficient justification for a proper and unbiased education of the public on any public issue. With respect to nuclear energy, the fact that almost one-fifth of the world's electricity will be derived from this source by 1985, makes this technology of sufficient national and international importance to require a greater public understanding.

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All of this will not in any way guarantee the health or survival of the nuclear industry. But without a proper involvement of all parties, it is virtually certain that decisions and choices will not be made on the best of evidence and fact.

The mix of the public's need, both for energy and information on its sources of energy, has been quite nicely summarized by Samuel Florman in his recently published book:

"Blaming Technology: The Irrational Search for Scapegoats."

> ". . . the future of nuclear energy depends at least as much on human needs and human fears as upon technical considerations."

I completely agree with that statement.

89-459 O - 82 - 2

Mrs. BOUQUARD. Thank you very much, Dr. Gottlieb, for your very excellent testimony.

Dr. Weaver, we welcome you and we look forward to your testimony, also.

STATEMENT OF DR. LYNN E. WEAVER

Dr. WEAVER. I am pleased to be here. My name is Lynn Weaver. I am Professor and Director of the School of Nuclear Engineering and Health Physics at the Georgia Institute of Technology, and Chairman of the Coordinating Committee on Energy of the American Association of Engineering Societies.

I am pleased to be here on behalf of the Coordinating Committee on Energy, a working committee of representatives from 23 major engineering societies having a membership of approximately 1 million engineers. The Committee is responsible for broad policy coordination and dissemination of technical information in the energy area.

The Coordinating Committee on Energy is deeply concerned over the polarization that has occurred in the energy debate and its effect on our ability as a society to arrive at sound technical public policy decisions. A prime example is the controversy surrounding nuclear energy and, to a lesser extent, the use of coal.

It is clear the public and, in some instances, legislative and administrative bodies are confused. This confusion has impeded our progress toward becoming less dependent on foreign energy sources. Further, a confused public could result in the passage of ill-founded legislation at the national and local levels that may put undue economic burden on the consumer.

A good example is the initiatives that have been introduced in some States to stop the construction of nuclear power plants until the technology has been developed to safely dispose of high-level nuclear waste.

Clearly, the nuclear waste issue is not a technical problem. The technology is in hand to safely isolate the waste from the biosphere.

Due to the lack of understanding of the technology and to the efforts of overzealous special interest groups, regulations have been imposed on the energy industry that are costly and counterproductive to their intent.

The public needs to be told the facts in understandable terms. They are being overwhelmed by information from both the advocates for and opponents against various energy sources. A third party with public credibility is needed to present the facts on those technical issues that are fundamental to the energy debate.

Public concerns such as nuclear wastes, the transportation of nuclear materials, reactor safety, acid rain and the CO_2 problem need to be addressed from a public information perspective.

Much of the recent debate has focused too frequently on emotional issues or technical trivia. The Coordinating Committee on Energy encourages Federal agencies to provide better public information.

In the nuclear area, as Dr. Gottlieb mentioned, this need was recognized by the President's Commission on Three Mile Island, the

Nuclear Regulatory Commission's Independent Rogovin Report and the Report of the Governor of Pennsylvania's Commission on Three Mile Island.

The Coordinating Committee on Energy specifically encourages the Department of Energy to take steps to substantially increase their support for the dissemination of public information on key energy issues.

It is recognized that Federal agencies, such as the Department of Energy, may have special interest groups within themselves that could use their publications as a vehicle to push their points of view. However, if properly structured, a balanced factual public information program could be developed.

In those areas that are sensitive to public concerns, it is recommended that agencies use independent institutions such as the National Academy of Sciences, the National Academy of Engineering or the American Association of Engineering Societies to assure a clear, accurate, and balanced presentation of the facts on technical issues.

One of the characteristics of our age is the need to manage critical social issues that evolve with the advancement of technology. Only through an informed electorate will we be able to develop an energy policy that will lead this Nation toward energy independence.

Thank you.

[The prepared statement of Dr. Weaver follows:]

A STATEMENT BY DR. LYNN E. WEAVER, BEFORE THE ENERGY RESEARCH AND PRODUCTION SUBCOMMITTEE, U.S. HOUSE OF REPRESENTATIVES

My name is Lynn Weaver. I am Professor and Director of the School of Nuclear Engineering and Health Physics at the Georgia Institute of Technology, and Chairman of the Coordinating Committee on Energy of the American Association of Engineering Societies.

I am pleased to be here on behalf of the Coordinating Committee on Energy, a working committee on representatives from 23 major engineering socieites having a membership of approximately 1,000,000 engineers. The Committee is responsible for broad policy coordination and dissemination of technical information in the energy area. The Coordinating Committee on Energy is deeply concerned over the polarization that has occurred in the energy debate and its effect on our ability as a society to arrive at sound technical public policy decisions. A prime example is the controversy surrounding nuclear energy and, to a lesser extent, the use of coal. It is clear that the public and, in some instances, legislative and administrative bodies are confused, and this confusion has impeded our progress toward becoming less dependent on foreign energy sources. Further, a confused public could result in the passage of ill-founded legislation at the national and local levels that may put undue economic burden on the consumer. A good example is the initiatives that have been introduced in some states to stop the construction of nuclear power plants until the technology has been developed to safely dispose of high-level nuclear waste. Clearly, the nuclear waste issue is not a technical problem. The technology is in hand to safely isolate the waste from the biosphere. Due to the lack of an understanding of the technology and to the efforts of over zealous special interest groups, regulations have been imposed on the energy industry that are costly and counter productive to their intent.

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Is is recognized that federal agencies, such as the Department of Energy, may have special interest groups within themselves that could use their publications as a vehicle to push their points of view. However, if properly structured, a balanced factual public information program could be developed. In those areas that are sensitive to public concerns, it is recommended that agencies use independent institutions such as the National Academy of Sciences, the National Academy of Engineering or the American Association of Engineering Societies to assure a clear, accurate and balanced presentation of the facts on technical issues.

One of the characteristics of our age is the need to manage critical social issues that evolve with the advancement of technology. Only through an informed electorate will we be able to develop an energy policy that will lead this nation toward energy independence.

Mrs. BOUQUARD. Thank you very much, Dr. Weaver, for your very fine statement.

You know when you are talking to the general public about nuclear power, you so often hear the statement there is not a great deal of scientific consensus; that there is more or less a raging scientific debate over nuclear power, and that there is some indication that the knowledgeable scientific community is split down the middle.

Do you really think this is a fair picture?

Dr. GOTTLIEB. No; I don't think it is a fair picture. I think the scientific community on the whole feels that nuclear energy is safe, that waste disposal certainly is a solved problem. There is, of course, always the feeling that there are steps which we could take which would make it even better, and those steps should be taken, and that is, I think, something on which you would again find broad consensus within the community, so I don't think that skepticism is justified.

There will always be people with differences of opinion on almost any subject. I suppose there might be some people around who are in favor of cancer. I don't happen to know them, but if I dug far enough I am sure I would find somebody. So that there will be no question of a judgment on which there is not some difference of opinion, but the predominant opinion is certainly that nuclear energy is safe, and that waste disposal is a problem of the past.

It remains a problem to some extent in the public mind because it has not been implemented and people say, "Well, gee, if you solved the problem, why haven't you done something?"

And I remember asking that question on many occasions in the past here in Washington, and the answers seem to be, "Yes, we know how to do it, but we will save money by not doing it now. We will put those costs off until later," and so while we are all waiting for that later to come around——

Mrs. BOUQUARD. It became a political problem?

Dr. GOTTLIEB. It became a political problem, that is right. In other words, it is now a political problem rather than a technical problem.

Mrs. BOUQUARD. We are happy that this committee has managed to get a waste management bill out. We hope we can see some action on it next year.

Dr. Weaver.

Dr. WEAVER. I would like to comment and amplify what Dr. Gottlieb said. As mentioned, I am chairman of the Coordinating Committee on Energy of the American Association of Energy Societies. The societies of this association has a membership of approximately a million engineers. This is most of the engineering talent in the United States. As you know, we have sent to you, Madam Chairman, copies of our various policy statements on energy issues, and these statements were not derived at lightly.

They were debated and discussed among our member societies, and the points of view that come out represent by far the overwhelming majority of the opinion of the engineering community. So there is no question that the technical community of this country support nuclear energy and its development and feel confident that the issues of safety, waste disposal, transportation, and so forth are well in hand, and the public is aptly protected as far as safety is concerned.

Mrs. BOUQUARD. Do you think the scientific community is getting all the information about nuclear energy and other energy sources that it needs from the Government? Is the Government doing its part to provide the scientific community with proper backup, and really what kind of Government information programs do you think would be of more help?

Dr. WEAVER. I think as far as the engineering community is concerned, the information is available to them through the various reports of national laboratories and other groups that are supported by DOE. The real void is informing the public of the facts on various energy sources.

When the AEC was in existence, they had a Division of Technical Information, which put out publications such as this one here, that were very informative in laymen's language, and did a lot in helping the public to understand different technical issues.

Mrs. BOUQUARD. There has been a controversy as to where these publications ended up.

Dr. WEAVER. That is true. There is a desperate need for all agencies, such as the NRC, EPA, the DOE, to provide information to the public on the key energy issues that is understandable. As I mentioned in my testimony, on very sensitive issues, institutions such as the National Academy of Sciences or the National Academy of Engineering could be used to make sure that a well-balanced presentation is made to the public.

Mrs. BOUQUARD. Would you care to comment on that?

Dr. GOTTLIEB. Yes; I would say to the scientist who is a serious student of one of these problems, of course he can go back to the primary literature and dig it out for himself. It may require a lot of work, and if your field is not this particular field, it represents quite an investment of your time and energy.

Therefore, the technical summaries addressed to the scientific and engineering communities are always valuable, but I agree with Dr. Weaver in saying that we need to go even further than that, because the technical jargon in many cases will be too difficult for

the public to handle, and I think there is some interpretation and some statements involving somewhat easier reading that is needed for the public.

To put it a different way, the Department of Energy has lots of information. Now, why is that information bottled up? That information should be transmitted to the public, to put it as simply as possible. That is the duty of the Department of Energy in my opinion.

Mrs. BOUQUARD. You spoke of the responsibility of the Government agencies to provide this information. Then you went on further in your testimony and brought out there is a responsibility of the public, responsibility of the press and responsibility of industry. Where do you see the placement of these roles? What is the proper role of the Government versus the role of industry in this area of nuclear power?

Dr. GOTTLIEB. Each has its role. I should say you cannot require of the public that they perform a certain role.

Mrs. BOUQUARD. Ideally, what would you say is the role of the industry?

Dr. GOTTLIEB. Ideally, I like the listeners, damn it. Excuse me. I have strong opinions on this subject. I have been lecturing since 1958, and it has been very disappointing to me over the years that my description of the problem remains the same. Obviously it does change somewhat, but by and large 75 percent of what I said in 1958 about the nature of the problem I can still say today.

It is just very difficult to get listeners, and of course listeners are confused. They do need information, but for every bit of it which I am able to transmit, there will be somebody saying, "Oh, no, no, no, that is not true at all." There will be some objector someplace or other, and it is for that reason I think that it is necessary to get information out of sources that the public trusts.

Mrs. BOUQUARD. Do you think we should have better identification of these sources of information?

Dr. GOTTLIEB. I think Dr. Weaver made a very good point. There are certain agencies which by and large are trusted by the public and one should make use of those. But I still say the Government has a very basic responsibility, to transmit that information which it possesses to the public in a form the public can handle.

Mrs. BOUQUARD. Thank you very much. If you had—I want both of you to answer this, if you will, please—if you just had one single message about nuclear power that you would like for the public to hear and understand, one concise message, what would that be, Dr. Weaver?

Dr. WEAVER. Nuclear power is needed, it is an energy source we cannot live without, it is safe as compared to all other energy sources. In this century only nuclear power and coal are available in a major way to reduce our dependence on imported energy and meet increased needs.

Mrs. BOUQUARD. Thank you very much.

Dr. Gottlieb, any further comments?

Dr. GOTTLIEB. I couldn't possibly improve upon that.

Mrs. BOUQUARD. I couldn't either.

I thank both of you so very much for being with us today, for your valuable testimony, for your contribution to our hearings today.

Dr. WEAVER. I thank you.

Mrs. BOUQUARD. The next panel of witnesses includes Mr. Leonard Theberge, president of the Media Institute. He will be accompanied by Dr. Robert L. DuPont, professor of psychiatry, Georgetown University Medical School, also president of the Phobia Society of America.

We are certainly happy to have you distinguished gentlemen here. Is Dr. DuPont with us? I don't think he is here. We are happy to have you right now, Mr. Theberge. Please proceed with your testimony.

STATEMENTS OF J. LEONARD THEBERGE, PRESIDENT, THE MEDIA INSTITUTE, AND DR. ROBERT L. DuPONT, CLINICAL PROFESSOR OF PSYCHIATRY, GEORGETOWN UNIVERSITY MEDICAL SCHOOL; PRESIDENT, THE PHOBIA SOCIETY OF AMERICA

Mr THEBERGE. Madam Chairman and members of the subcommittee, my name is Leonard J. Theberge. I am President of the Media Institute, a nonprofit research foundation located here in Washington, D.C. I appreciate the opportunity to appear before you this morning.

Let me say at the outset that the Media Institute is not a lobbying group, nor do we have a position for or against nuclear power. We are an independent research organization which monitors and analyzes media coverage of various business and economic issues, and we are supported by a wide range of corporations, foundations and individuals.

We have, however, published several studies which address the specific question of media coverage of the nuclear industry.

In our first major study entitled "Television Evening News Covers Nuclear Energy: A 10-year Perspective," we reviewed videotapes of every single evening news story broadcast by the three national networks from August 1968 to April 1979, a total of 490 stories comprising 13½ hours of broadcast time.

Especially relevant to this hearing was our analysis of the bias in these stories measured in several different ways, as described in my full statement. I should like to share some of the major findings with you. Before and during the Three Mile Island incident, coverage was overwhelmingly devoted to news events and peripheral information to the virtual exclusion of factual background information. Researchers found that nuclear energy stories tended to concentrate on protests and charges by antinuclear groups.

Second, opening statements in nuclear stories introduced a negative bias in 17 percent of the stories before Three Mile Island. Most of the stories during this period were neutral. During the Three Mile Island incident, the number of opening statements with a negative bias jumped to 47 percent. The numbers were similar for closing statements having a negative bias, 11 percent before, and 46 percent during Three Mile Island. A majority of the 10 most frequently quoted outside sources were against nuclear power, or were critical of safety procedures at Three Mile Island.

Of the air time allotted the views of the top 10 prior to the Three Mile Island incident, about 20 out of the 28 minutes, or 72 percent, was antinuclear.

Based on these and other findings presented in my full report, we reached two main conclusions: First, if you were relying on network evening news broadcasts as a primary source of information, you could not have gained sufficient knowledge to make a rational assessment of the risks and benefits of nuclear power generation, and second, that network television methods and procedures of reporting, editing, and presenting information on nuclear power generation introduced bias into supposedly objective news broadcasts.

Because of the apparently exaggerated emphasis these stories placed on the "what if" possibilities of risk rather than on the

actual experience of risk, we invited Dr. Robert DuPont to view and comment upon the entire set of videotapes.

I will turn now to the period following Three Mile Island and to the report of the Kemeny Commission. This Commission was appointed by President Carter to investigate all aspects of the Three Mile Island incident. In its report of October 1979, the Commission concluded that the public was poorly served due to a combination of confusion on the part of the information sources upon which the news media relied, and a lack of understanding of the issues on the part of the news media.

In its recommendations directed toward the news media, the Commission stressed the need for the media to become better informed about nuclear reactors and to improve their ability to communicate nuclear issues to the public.

Four months after the release of the Commission's report, the Media Institute mailed out a survey questionnaire to ascertain how Federal and State agencies, the utilities, and the news media viewed the Commission's report, particularly with respect to the public's need to know. Results of the survey were disappointing in several ways. We found that the news medium considered most critical in the event of a crisis, that is, local radio, seemed to have made the fewest improvements toward becoming better prepared to report on future emergencies.

Fewer than half of all news media respondents were even aware of the Commission's recommendations that were specifically addressed to their profession. This level of interest was reflected in the poor response rate to our survey. While 53 percent of the nonmedia organizations responded, only 33 percent of the news media did so. Of the 50 questionnaires mailed to national television network news personnel, we received only one response despite our telephone followup efforts.

I would like to submit copies of both the 10-year study and the Kemeny Commission survey to you and ask that they be made a part of the record, Madam Chairman.

Mrs. BOUQUARD. Without objection, they will be part of the record.

Mr. THEBERGE. Thank you. I would like to comment now on another example of how the national network news has a tendency to distort the facts and to sensationalize issues related to nuclear powerplants.

On November 25, 1979, "60 Minutes" did a 16-minute segment on cost overruns experienced by the Illinois Power Co., in its construction of a nuclear plant in Clinton, Ill. This case is described in my full statement, and in the Media Institute's monograph which is entitled "Punch Counterpunch-60 Minutes versus Illinois Power," but I would like to highlight one aspect of that "60 Minutes" segment that is consistent with the findings of our 10-year study.

In the transcript of that segment, the lead-in by Harry Reasoner provides a good example of the negative bias that we frequently observed in our 10-year study. Let me quote, then, just the first third of his opening statement:

The American nuclear power program is in trouble, and not only because of Three Mile Island and the Presidential Commission's reports on hazards. It is in trouble because the cost of building the plants has gone crazy, a "China Syndrome" of costs.

Not only is the tone of this statement negatively biased but you will also note once again the play made upon the public's phobia over the risk posed by nuclear energy, particularly in Mr. Reasoner's reference to the "China Syndrome," a movie that centered on the possibility of a nuclear meltdown that could have caused a disaster of holocaust proportions.

Why is nuclear coverage subject to bias? I would like to share a few insights into the nature of television news which may begin to explain this kind of bias. In an attempt to attract a mass audience, all three networks emphasize and at times exaggerate the elements of conflict within a given issue. Indeed, framing a news story as a confrontation between two opposing sides, often presented as "white hats" and "black hats," has become a standard approach to news writing about controversial subjects. This confrontation is especially melodramatic when the black hats are presented as being in a position of power and authority while the white hats are shown as relatively powerless even to the point of being oppressed, threatened or harmed in some way by the black hats.

Another factor influencing nuclear coverage is a result of personalized journalism in which a complex issue is reduced to its emotional effects on one person or family. For example, a story about declining auto sales might be told in terms of a laid-off autoworker.

Nuclear power is an ideal subject for these models. In the first instance it can be simplified to a battle between industry motivated by profit and, implicitly, greed; and people motivated by health and environmental concerns. These people are often shown as the powerless victims of an authoritarian, monolithic nuclear industry.

In the second instance, the complexities of the nuclear power issue can be reduced, for example, to the story of a mother living near a nuclear plant, who expresses fears about the long-term health hazards to her children. In both cases the coverage tends to be melodramatic at the expense of more balanced and analytical reporting.

The problems surrounding television's coverage of nuclear issues are compounded by the fact that the press itself appears largely uninformed about nuclear power, a phenomenon noted by the Kemeny Commisssion in its report. Given both the appetite of network news for dramatic confrontation and the reporters' relative lack of knowledge, it is no wonder the substance and content of nuclear coverage on TV has suffered, but we must also address the quantitative aspect, which itself is a major factor affecting nuclear reporting.

The 30-minute network news program contains about 22 minutes of actual news time, and this makes network news little more than a headline service. But this time crunch tends to introduce a bias simply because there is not enough time to begin painting a thorough picture of the many issues in a subject as complex as nuclear power. But I must note that this fate is not limited to the nuclear

issue. The Media Institute has been studying television news coverage of the two oil crises of the 1970's, and we found many of the same factors at work in these oil stories.

Thus far I have discussed the television coverage of the nuclear industry in terms of what was reported and why. I will now turn to a broader question, the importance of the public's need for information or the need to know. Perhaps no concept is more fundamental to the functioning of a democracy than the free flow of information, and its role in shaping public opinion on issues of the day, especially political issues like nuclear power. But as we have seen, network television has not been particularly adept at providing an adequate flow of unbiased information about nuclear energy. I do, however, believe there is some hope for improved coverage, despite the inherent weaknesses I have outlined in television news coverage.

To a great extent, that hope lies in providing the media with more and better information about nuclear power. In our Kemeny Commission survey, for example, we found that 89 percent of the TV network affiliates responding said that they or someone from their station would be willing to attend seminars on the basics of nuclear power generation. Of the affiliates responding, 55 percent have assigned a staff member to cover nuclear power issues, while 93 percent of those so designated have sought to develop an understanding of nuclear power generation.

We believe the nuclear industry, the utilities, the manufacturers of reactors and component parts and their respective trade associations ideally should be expected to play a central, if not primary, role in providing the media and the public with accurate information. But of course this has been and will probably continue to be an uphill battle, because the media tend to perceive and portray industry sources as one dimensional and highly biased by self-interest.

Government agencies such as the Department of Energy and the Nuclear Regulatory Commission have a legitimate voice in this information process, especially on questions of Government policies and on aspects of nuclear power production, which are subject to Government control. These Government spokesmen can be expected to have a decided advantage because our research on the inflation issue indicates that Government sources may enjoy a much higher degree of credibility with the media than do private sector sources.

It is fair to expect, then, that Government statements or actions regarding nuclear power will draw considerable media attention. Thus, we would urge that nuclear-related agencies be especially aware of their public trust to provide accurate and unbiased information.

Having studied television news coverage of nuclear energy for several years, we have concluded that the public has not been well served in its need to know about this important topic. The coverage has been inadequate in terms of the amount of attention paid to the issues, the tendency for negative biases to intrude on objective reporting, and the lack of perspective offered to viewers. This is due in large part to the netw.rks' undue emphasis on the confrontational elements in news stories, especially where powerful insti-

tutions are pitted against hapless individuals; to the reduction of complex issues to personal vignettes; to the limited time available each night for indepth reporting; and to the reporters' lack of knowledge about nuclear energy.

The public, however, has a crucial need for timely, accurate and unbiased information about nuclear energy. I would like to offer two recommendations to help meet this need. First, I believe it would be useful for utility companies and other industry groups to take an aggressive role in arranging seminars for journalists. As I said, our Kemeny survey suggested journalists are very interested in gaining background information on energy, particularly if seminars are held at convenient times and places.

Second, I believe nuclear-related agencies such as DOE could, in addition to their normal public information activities, perform a valuable public service by periodically issuing clarifications of, and, if need be, rebuttals to biased nuclear stories appearing in both the print and broadcast media. Such a program would put to constructive use the Government's higher degree of credibility with the media, while contributing to a better informed public, particularly where the story turns on the inappropriate or erroneous use of Government data.

In the case of television news, this would involve reviewing tapes of network news stories on nuclear topics and issuing statements when appropriate. The preliminary review function could even be performed by an independent organization which would submit tapes to the agency. The agency then would decide which stories merited comment, and even if these clarifications were not broadcast, they would still contribute to the education of reporters covering nuclear energy, a worthwhile goal in and of itself.

Madam Chairman, this concludes my testimony. I would like to thank members of the subcommittee for their concern and their attention. If any of you would like more information or further discussion of our recommendations, I would be more than pleased to respond in writing following today's hearings and I would certainly welcome any questions you have today.

[The prepared statement and submissions of Mr. Theberge follow:]

Statement of
Leonard J. Theberge, President
The Media Institute
Washington, D.C.

Madam Chairman and members of the Subcommittee, my name is Leonard J. Theberge. I am president of The Media Institute, a nonprofit research foundation located here in Washington, D.C. I appreciate the opportunity to appear before you this morning.

Let me say at the outset that The Media Institute is not a lobbying group, nor do we have a position for or against nuclear power. We are an independent research organization which monitors and analyzes media coverage of various business and economic issues, and we are suported by a wide range of corporations, foundations and individuals.

We have, however, published several studies which address media coverage of the nuclear industry. More specifically, these studies focus on television network evening news coverage -- and for good reason. Surveys, such as those done by the Roper Organization, have found that television is the prime source of news for two-thirds of our population and that the general public ranks television higher in credibiity than any other news medium. Thus, I will focus today primarily on television network news coverage of nuclear issues.

The Media Institute has conducted two major studies of news media coverage of nuclear energy production. The first study examines the way national television covered nuclear energy from August 1968 through March 1979, a study period that includes coverage of the

Three Mile Island accident. The second study turns its attention to Three Mile Island, examining the news media's response to that aspect of the Kemeny Commission's report on how the public's need to know might be better served in the event of a future nuclear power plant accident. I would like to submit copies of these studies to you, and ask that they be made a part of the record. I will also make reference to an interview with Dr. Robert DuPont which has been published by The Media Institute. In it he assessed the general public's underlying phobia that has had such an important influence on the nature of public debate over nuclear energy.

A fourth publication of The Media Institute, which I will refer to in my testimony, is a monograph on the encounter between the Illinois Power Company and CBS's 60 Minutes, one which confirms several of the findings from our ten-year study. I will be distributing copies of these publications to each Subcommittee member for reference after conclusion of this hearing.

Television Evening News Covers Nuclear Energy: A Ten-Year Perspective

In February 1979, just several weeks before the Three Mile Island accident, The Media Institute conceptualized a project to study the role of the national TV networks in covering news pertaining to nuclear power production. In that study, we reviewed videotapes (supplied by the Vanderbilt Television News Archive) of every news story broadcast by the three national networks in their evening news programs from August 1968 to April 1979 -- a total of 490 stories comprising thirteen and one-half hours of broadcast time. Particularly relevant to the subject of this hearing was our analysis

of the degree to which the news was reported in a biased manner, as reflected in the language (both positive and negative) used in the opening and closing statements of the news broadcaster but which was unsupported by the facts presented in the main body of the news story. Bias was also examined through assessing the networks' use of interviews with individuals or organizations who were in favor of, or opposed to, nuclear energy production. Finally, we performed a content analysis of the reporting to measure the relative attention given to reporting 1) straight news (the "who, what, when, where, and why" of an event); 2) peripheral (and generally insignificant) background information; and 3) factual background information through which viewers could gain a perspective on the significance of the news being reported. The most important findings from that study are as follows:

1. In the decade before the Three Mile Island incident, when nuclear power grew from one to thirteen percent of our electricity supply, one-quarter of one percent of the total possible broadcast time was devoted to covering events related to nuclear energy production.

2. Before and during the Three Mile Island incident, coverage was overwhelmingly devoted to news and peripheral information, to the virtual exclusion of perspective reporting. Researchers found that nuclear energy stories tended to focus on protests and charges by anti-nuclear groups.

3. Opening statements in network evening news stories on nuclear power generation introduced a negative bias in 17% of the stories before Three Mile Island. During the TMI incident, the number of opening statements with a negative bias jumped to 47%. The numbers were similar for closing statements having a negative bias - 11% before and 46% during Three Mile Island.

4. A majority of the ten most frequently quoted outside sources were against nuclear power or critical of safety procedures at Three Mile Island. Of the air time allotted the views of the "top ten" prior to the TMI incident, about 20 out of 28 minutes, or 72%, was anti-nuclear.

Based on these and other findings presented in the full report, we reached two main conclusions:

1. A viewer relying on network evening news broadcasts as a primary source of information could not have gained sufficient knowledge to make a rational assessment of the risks and benefits of nuclear power generation; and

2. Network television methods and procedures of reporting, editing and presenting information on nuclear power generation introduced bias (probably unintentional and in this case anti-nuclear) into supposedly objective news broadcasts.

In addition, researchers in our study reached an informal conclusion that the strongest impression given by the news coverage was one of fear concerning the potential risk of nuclear energy both to the environment and to human health and safety. Because of the emphasis placed on the fearful, "what-if" possibilities of risk, rather than on the actual experience of risk, we invited Dr. Robert DuPont to view and comment upon the entire set of videotapes. He concluded that the networks introduced irrational, phobic fear into their nuclear stories. I am sure Dr. DuPont will elaborate on this in his testimony.

Impact of the Kemeny Commission Report

Two weeks after the Three Mile Island accident, President Carter established a commission, under the direction of Joseph Kemeny, to make a full investigation of the incident, including an assessment of how well the public's need for accurate, comprehensible and timely information was served. The Commission published its report on October 31, 1979.

The Commission concluded that the public was poorly served, due to a combination of confusion on the part of information sources upon which the news media relied, and a lack of understanding of the issues on the part of the news media. In its recommendations directed toward the news media, the Commission stressed the need for all national news media outlets and for news media located near nuclear power plants to (a) become better informed about nuclear reactors, and (b) improve their ability to "place complex information into a context that is understandable to the public (that they may

better) make decisions regarding their health and safety."

Four months after release of the Commission's report, The Media Institute mailed out a survey questionnaire to ascertain how federal and state agencies, the utilities, and the news media viewed the Commission's report, particularly with respect to the public's need to know. In the news media, questionnaires were sent to station news directors, correspondents, network news executives, station news directors, bureau assignment desks, energy reports, and correspondents.

Results of the survey were disappointing in several ways and yet provide hope. We found that the news medium considered most crucial in the event of a crisis (local radio) seems to have made the fewest improvements toward becoming better prepared to report on future emergencies. Fewer than half of the news media respondents were even aware of the Commission recommendations that were specifically addressed to their profession. This level of interest, bordering on outright apathy, was reflected in the poor response rate to our survey. While 53% of the non-media organizations responded, only 33% of the news media did so. Of the 50 questionnaires mailed to national television network news personnel, we received only one response, despite our efforts in follow-up telephone calls to encourage their participation.

On the positive side there was a sincere attempt being made by many public and private institutions to prepare for the future. Ninety-five percent of media respondents wanted to learn more about nuclear power generation.

I would like now to comment on another example of how the national network news has a tendency to distort the facts and to sensationalize issues related to nuclear power plants. On November 25, 1979, 60 Minutes did a sixteen-minute segment on cost overruns experienced by the Illinois Power Company in its construction of a nuclear plant in Clinton, Illinois. Prior to doing the story, CBS agreed to let Illinois Power videotape the filming of all interviews given by its employees. Objecting to the 60 Minutes' treatment of the issue, Illinois Power produced a 44-minute videotape, entitled 60 Minutes/Our Reply, which incorporates the entire 60 Minutes segment interspersed with film and narrative giving the company's rebuttal. The additional film consisted of interview footage that 60 Minutes had chosen not to include in its own treatment.

By December 1980, more than 2,300 copies of Our Reply had been distributed to corporate executives, legislators, journalists and others who had heard about the power company's battle with the prestigious and powerful 60 Minutes. Not only did Our Reply succeed in getting 60 Minutes, on its January 27, 1980 telecast, to admit to two inaccuracies in its original story, but several large companies are now considering this strategy of defensive videotaping for dealing with television journalists. To help interested observers judge the fairness of 60 Minutes in its treatment of the cost overrun story, The Media Institute published a monograph earlier this year consisting of a summary of the issues contested by Illinois Power, the complete transcript of 60 Minutes/Our Reply, CBS's letter responding to Our Reply, and Illinois Power's rebuttal of the CBS letter.

Before continuing I would like to highlight one aspect of the 60 Minutes segment that is consistent with the findings of our ten-

year study. In the transcript of the segment, the lead-in by Harry Reasoner provides a good example of the negative bias that we frequently observed in our ten-year study. Let me quote just the first third of his opening statement:

> "The American nuclear power program is in trouble. And not only because of Three Mile Island and the Presidential Commission's reports on hazards. It's in trouble because the cost of building the plants has gone crazy. A China Syndrome of costs."

Not only is the tone of this statement negatively biased, but you will also note, once again, the play made upon the public's phobia over the risks posed by nuclear energy, particularly in Mr. Reasoner's reference to the China Syndrome, a movie that centered on the possibility of a nuclear meltdown that could have caused a disaster of holocaust proportions.

Elsewhere in Mr. Reasoner's narrative, there were several instances in which he used what I would call "folksy" language, presumably in an attempt to have viewers identify with him as the "little guy" doing battle with the power structure. He referred to the cost overruns as "expensive and complex fun and games," costing just "too darn much," that customers will have to "pony up," and that "you can make book around here" that there will be more delays in the company's construction schedule. While this amiability adds to the entertainment appeal of the program, clearly it also puts the power company in an unfair position of being the "bad guys" riding over the public's pocketbook.

Why Is Nuclear Coverage Subject to Bias?

Our studies indicate clearly that nuclear coverage has been prone to unfavorable, and indeed biased reporting both on television

evening news programs and on the "soft news" programs such as 60 Minutes. We cannot presume to state definitively why nuclear coverage is presented in this way. But I would like to share some insights into the nature of television news which may begin to explain this bias.

In an attempt to attract a mass audience, all three networks have a tendency to emphasize (and at times exaggerate and exploit) the elements of conflict within a given issue. Indeed, framing a news story as a confrontation between two opposing sides -- often presented as white hats and black hats -- has become a standard approach to newswriting about controversial subjects.

This confrontation is especially melodramatic when the "black hats" are presented as being in a position of power and authority while the "white hats" are shown as relatively powerless, even to the point of being oppressed or harmed in some way by the "black hats." This is manifested in the "David vs. Goliath" genre of stories (mainly feature stories) -- e.g. the inventor/entrepreneur who is fighting a losing battle against government regulators at the Environmental Protection Agency who refuse to approve his automobile fuel economy device, or the grizzled farmer in the South who is ready to take up arms rather than be displaced and see his farm flooded as part of a government dam project.

This theme of people oppressed by public and private institutions has, of course, been a popular and recurring one in the fiction of this century in novels, movies, and more recently, television entertainment programs. Our study Crooks, Conmen and Clowns: Businessmen in TV Entertainment found, for example, that two out of three businessmen

in prime time TV programs are presented in an unfavorable light and that senior corporate executives are portrayed about half the time as criminals. But there is mounting evidence (including the examples cited earlier) that television news reporters, particularly on the soft news programs such as 60 Minutes, have adopted this confrontation theme as their own.

Another factor influencing nuclear coverage is the role of "personalized" journalism in which a complex issue is reduced to its emotional effects on one person or family -- for example, a story about declining automobile sales might be told in terms of a laid off autoworker who describes the hard times ahead for his wife and children (who, appropriately long-faced, surround him at the kitchen table as he is interviewed).

Nuclear power is an ideal subject for these models. In the first instance, it can be simplified to a battle between industry, motivated by profit (and implicitly greed), and people, motivated by health and environmental concerns. And these people are often shown as the powerless victims of an authoritarian, monolithic nuclear industry. In the second instance, the complexities of the nuclear power issue can be reduced, for example, to the story of a mother living near a nuclear plant who expresses fears about the long-term health of her children. In both cases, coverage tends toward the melodramatic at the expense of balanced, analytical reporting.

Daniel Schorr, former CBS correspondent now with the Cable News Network, describes the tendency of television to blur the line between reality and fantasy, and notes the role of TV news in this process:

> "Television news itself -- obliged to coexist with its entertainment environment, seeking to present facts with the tools of fantasy -- ends up with a dramatized version of life. Everything that goes into making a well-paced, smoothly edited 'package' subtly changes reality into a more exciting allegory of events. The confusion is compounded by the use of 'cinema realite' techniques in fictional dramas, and the modern forms of fact-and-fiction 'docudramas' and 'reenactments' of events." ("Go Get Some Milk and Cookies and Watch the Murders on Television," Washingtonian, October 1981, P. 192)

The problems surrounding television coverage of nuclear issues are compounded by the fact that the press itself appears largely uninformed about nuclear power. This was noted by the Kemeny Commission in its report:

> "The reporters who covered the accident had widely divergent skills and backgrounds. Many had no scientific background. Because too few technical briefers were supplied by NRC and the utility, and because many reporters were unfamiliar with the technology and the limits of scientific knowledge, they had difficulty understanding fully the information that was given to them. In turn, the news media had difficulty presenting this information to the public in a form that would be understandable." (Kemeny Commission Report, p. 58)

Given both the appetite of network news for dramatic confrontation and the reporters' relative lack of knowledge, it is no wonder the substantive content of nuclear coverage on TV has suffered.

But we must also address the quantitative aspect which itself is a major factor affecting nuclear reporting. The 30-minute network news program contains about 22 minutes of actual news time. In an atmosphere where a "long" story is three minutes, it comes as no surprise that the network evening news programs have done a poor job of providing in-depth background information on the more technical and complex aspects of nuclear power. These programs are, after all, primarily headline services for recounting the immediate events of the day. The half-hour format creates an inherent weakness in

terms of in-depth reporting; but we must recognize that network news can be little more than a headline service when limited to 22 minutes.

The net result of this time crunch, however, is that it tends to introduce a bias -- quite possibly, an unintentional bias -- simply because there is not time enough to begin painting a thorough picture of an issue as complex as nuclear power. But I must note that this fate is not limited to the nuclear issue. Next month, for example, The Media Institute will begin publishing a three-volume study on television news coverage of the oil crises of the 1970s. We found many of the same factors at work in these oil stories such as confrontation and the compression of complex ideas into a limited time frame.

The Public's Need to Know

Thus far I have discussed television coverage of the nuclear industry in terms of what was reported and why it was reported in that way. I will now turn to a broader question, the importance of the public's need for information -- the "need to know."

Perhaps no concept is more fundamental to the functioning of a democracy than the free flow of information and its role in shaping public opinion on the issues of the day. The public must be informed about its government's programs and policies, about subjects that have a basic influence on the shape and growth of the country, and about issues that are debated in our political arenas.

From our perspective of analyzing the media -- which have become the basic conduit of information to the public -- we have

become particularly sensitive to the need for accurate and complete information if the public and its elected representatives are to make rational policy choices.

Indeed, nuclear power has become a full-blown political issue. We understand that some 16 state initiatives on the future of nuclear power have been placed before the electorate since 1976, requiring voters in more than a half-dozen states to make a determination about the need for, and safety of, nuclear power. For a political issue of this magnitude, a constant flow of accurate, timely information is essential for informed decisions.

But as we have seen, network television has not been particularly adept at providing either an adequate or unbiased flow of information about nuclear power. Perhaps this is to be expected to some degree, given the inherent weaknesses in television news I have outlined.

I do, however, believe there is some hope for improved coverage. To a great extent, that hope lies in providing professional reporters with more and better information about nuclear power. In our Kemeny Commission survey, for example, we found that 89% of the TV network affiliates responding said they, or someone from their station, would be willing to attend seminars on the basics of nuclear power generation. Of the affiliates responding, 55% have assigned a staff member to cover nuclear power issues, while 83% of those so designated have sought to develop an understanding of nuclear power generation.

We believe the nuclear industry -- the utilities, the manufacturers of reactors and component parts, and their respective trade associations -- ideally should be expected to play a central, if not primary role in providing the media and the public with accurate information.

But of course, this has been and will probably continue to be an uphill battle because the media tend to perceive industry sources as highly biased.

Government agencies such as the Department of Energy and the Nuclear Regulatory Commission have a legitimate voice in this information process as well, especially on questions of government policy and on aspects of nuclear power production which are subject to government control. And these government spokesmen can be expected to have a decided advantage -- because our research on another issue indicates that government sources enjoy a much higher degree of credibility with the media than do private sector sources. In 1980, The Media Institute commissioned Tom Bethell, Washington editor of Harpers, to analyze television news coverage of the inflation issue. He found that government sources were the basis of 77% of the inflation stories broadcast. He also discovered that 77% of inflation stories tended to exonerate the government as a cause of inflation, pointing instead to events in the private sector such as rising wages and prices.

It is fair to expect, then, that government statements or actions regarding nuclear power will continue to draw considerable media attention. This presents both an obvious communications opportunity and a formidable challenge -- and I would emphasize the challenge.

For it is precisely because government agencies have the higher burden to act in the public interest that they are regarded so highly by the media as a source of information. And yet, as our inflation study shows, government sources can often be found in self-serving postures and journalists can be easily manipulated.

Given the emohe emotionalism, fear and public distrust surrounding the nuclear issue, we believe nuclear-related agencies must be especially aware of their public trust to provide accurate and unbiased information.

On the other hand, in order to avoid manipulation by the government or pro- or anti-nuclear groups, it is essential that reporters know enough about the issues to avoid lending credence to the more nonsensical assertions.

Summary and Recommendations

Having studied for several years the role of television network news in covering the nuclear energy issue, we have concluded that the public has not been well served in its need to know about this important topic. The coverage has been indadequate in terms of the amount of attention paid to the issue, the tendency for unfounded negative biases of reporters to intrude on objective reporting and the lack of perspective offered to viewers.

This is due in large part to the networks' undue emphasis on the confrontational elements in news stories, especially where powerful institutions are pitted against hapless individuals; to the reduction of complex issues to personal vignettes; to the limited time available each night for in-depth reporting; and to the reporters' lack of knowledge about nuclear energy, which not only makes it difficult to communicate effectively, but also promotes unnecessary fear.

The public has a crucial need for timely, accurate and unbiased information about nuclear energy. Both industry and government sources have an appropriate role, as do responsible critics, in

that information; there is some evidence suggesting that news outlets are better equipping themselves to receive and convey information on nuclear issues, but much work still needs to be done.

I would like to offer two recommendations for improving this information flow.

First, I believe it would be useful for utility companies and other industry groups to take an aggressive role in arranging seminars for journalists. Our Kemeny survey suggests journalists are very interested in gaining background information on nuclear energy, particularly if seminars are held at convenient times and places.

Second, I believe nuclear-related agencies such as DOE could, in addition to their normal public information activities, perform a valuable public service by periodically issuing clarifications of (and if need be, rebuttals to) inaccurate or biased nuclear stories appearing in the print and broadcast media. Such a program would put to constructive use the government's high degree of credibility with the media while contributing to a better-informed public -- particularly where the story turns on the inappropriate or erroneous use of government data. In the case of television news this would involve reviewing tapes of network news stories on nuclear topics and issuing statements when appropriate. The preliminary review function could even be performed by an independent organization which would submit tapes to the agency, which would then decide which stories merited comment. Even if these clarifications were not broadcast, they would still contribute to the education of reporters covering nuclear energy -- a worthy goal in itself.

This concludes my testimony. I would like to thank members of the Subcommittee for their concern and attention to what I have said this morning. If any of you would like more information or further discussion of my recommendations, I would be pleased to respond in writing following today's hearing. At this time I welcome your questions.

# # #

Summary and Conclusions

Television Evening News Covers Nuclear Energy: A Ten Year Perspective

the media institute

Summary and Conclusions

A detailed and substantive analysis of more than a decade of television evening news coverage of nuclear power generation in the United States has resulted in two major conclusions by The Media Institute:

1. A viewer relying on network evening news broadcasts as a primary source of information could not have gained sufficient knowledge to make a rational assessment of the risks and benefits of nuclear power generation;

2. Network television methods and procedures of reporting, editing and presenting information on nuclear power generation introduced a bias (probably unintentional and in this case anti-nuclear) into supposedly objective news broadcasts.

The conclusions are based on a study of network evening news telecasts from August 5, 1968 to April 20, 1979, by The Media Institute, a non-profit foundation headquartered in Washington, D.C.

During the time period studied, the amount of electrical energy supplied by nuclear power plants rose from about 1% of the nation's total to 12.6%.

The Media Institute study shows that in the period prior to the accident at Pennsylvania's Three Mile Island nuclear generating facility on March 28, 1979, coverage of nuclear energy was just 26/100th of one percent of the time available for news stories on the evening telecasts of the three major networks.

The study also shows that of that minimal amount of coverage, almost none provided perspective upon which viewers could base assessment of the significance, risks or benefits of nuclear energy generation. By contrast, more than 20% of the reports used on nuclear energy focused on events such as protests and demonstrations, peripheral to the central issues. Many of the straight-news reports, which made up the largest percentage of time, consisted of changes and statements answering those charges. Viewers were usually left to judge the merits of the case almost solely on statements from each extreme.

Finally, the study's findings reveal that although it is most likely unintentional, many of the common practices involved in reporting and presenting news stories on television introduced a bias within news reports, usually against nuclear energy. These included wording of opening and closing statements as well as the selection of outside "experts" for quotation or appearances on the air.

The Media Institute also concluded from its study that had there been more complete coverage of nuclear energy issues before March 28, 1979, the viewing public would have been in a much better position to discern the significance of, and potential danger from, the Three Mile Island accident.

Improved News Coverage

The study of nuclear energy is the first in a series planned by the Institute in furtherance of its objective of working for improved news coverage of business and economics. The Media Institute is funded by grants from foundations, associations and corporations. No funding from the nuclear industry was used for this study.

The Institute took no position in favor of/or against nuclear power generation. Nor was its purpose to identify any possible factual errors in

news coverage. Rather the purpose of the study was to assess the quality of network evening news coverage of this key issue in order to determine if viewers had been provided sufficient facts upon which to base judgments of events.

The scope of the study was determined by several factors.

The impression a television news story makes on a viewer is dependent upon the combination of sight and sound. So, The Media Institute chose to use news program videotapes for its analysis, rather than rely on transcripts of the words alone. The only readily available set of videotapes for this purpose is in the Vanderbilt (University) Television News Archive. These date from August 5, 1968, so that date determined the beginning of the time period studied.

Two Phases Covered

The study covered two separate time phases within the period:

The first began on the date of the first available Vanderbilt tapes, August 5, 1968, and ran through the day before the Three Mile Island accident, March 27, 1979. During this study phase, weeknight evening news programs were studied because they represent the primary news effort for each network and because they reach the largest audiences.

The second phase studied began with the Three Mile Island accident, March 28, and ran through April 20, 1979, the day the plant was shut down and the emergency was declared over. During those 24 days, weeknight *and* weekend evening news broadcasts were analyzed. (ABC has no regular Saturday news broadcast.)

There is no evidence to suggest that inclusion of data from other newscasts and news and public affairs programming, if tapes had been available, would have significantly altered the study's findings and conclusions.

The Media Institute recognizes that network television is just one of the ways Americans get their news and information. It also acknowledges the extremely high degree of technical competence achieved by network producers, technicians and reporters in bringing the daily world's events into millions of American living rooms within the 22 minutes devoted to news in a 30-minute broadcast.

On the other hand, network news officials claim to be the primary source of news to most Americans. Fred Silverman, president of the National Broadcasting Company, put it this way in an address to the National Press Club in Washington, D.C., September 19, 1979: "Roper Surveys show that for two-thirds of our population, television is their prime source of news. They rank television higher in credibility than any other medium . . . these statistics dramatize the closest relationship any business has ever had with the American public. Television is a central institution in their daily lives; they care about it and take it very seriously."

In its study, The Media Institute differentiates between various kinds of television news coverage. A news "broadcast" or "program" refers to the 22-minute period the networks say represents the average time available for news within the regular 30 minutes allotted. News "stories," for the purposes of the study, are considered to include all of the information and reports relating to a single subject within a single broadcast. News "reports" are parts of a story: a story could consist of one report or several, so long as they all related to the central subject. (If two earthquakes occurred the same day, reports on each would constitute one story.)

The Media Institute utilized a set of central questions about nuclear energy as criterion about what is and is not significant to the issue. The questions were developed by the Nuclear Energy Policy Study Group sponsored by the Ford Foundation. They included the economic importance of nuclear power and its major alternative energy sources, the extent of world uranium supplies, and safety, environmental and health effects of nuclear generating facilities, compared with those of other energy sources, and nuclear waste disposal.

From its inception, as the Ford Foundation-spon-

sored study pointed out, nuclear electrical generation has had to bear the burden of its evolution from the technology for weapons capable of destroying mankind. It has been the most significant result of efforts to harnass the split atom for peaceful use since World War II. The U.S. now has 72 reactors with operating licenses. One state, Vermont, receives 79% of its electricity from nuclear generation.

Interestingly, nuclear power and television as a mass-medium have grown up together, since television is also largely a post-war development, at least as far as the vast majority of Americans is concerned.

Major Conclusions

Among the major findings from The Media Institute's study, which led to the two major conclusions, are these:

A. Coverage of domestic nuclear power in the decade before Three Mile Island was minimal, as a percentage of the total broadcast time available on the evening newscasts of the three networks.

Based on the three networks own figures of 22 minutes of actual broadcast news time in a regular 30-minute program, there was a total of 182,688 minutes of weekday news broadcast time over the 10 year, eight month period studied. Coverage of nuclear energy for that period was 472 minutes, or 26/100 of one percent of available time.

It is apparent from an analysis of the pattern of coverage, that interest in nuclear energy by the networks was stimulated by the general environmental awakening that led up to and followed "Earth Day" in April, 1970. After just one 15-second story on NBC during 1969, (and no coverage in the last 5 months of 1968), the three networks devoted a total of 46-minutes, 44 seconds to the subject in 1970 (26/100 of one percent). Thereafter, coverage dropped down and did not again reach 1970's level until 1976. During the mid-1970s, the energy crisis came to the forefront of American attention, and with it came increased anti-nuclear activity, which generated much of the nuclear news during the period from 1975 to early 1979.

Of the three networks, CBS-TV had the most coverage (149 stories, 180 minutes); followed by NBC (104 stories, 162 minutes) and ABC (95 stories, 131 minutes). (See table, page 8)

B. Coverage of nuclear energy generation before and after the Three Mile Island accident was overwhelmingly devoted to news and peripheral information, to the virtual exclusion of background for the viewer's perspective.

A review of the abstracts of videotapes of stories on nuclear energy indicates they focused mostly on protests and charges by anti-nuclear groups rather than generation of electricity, or the risks and benefits.

The Institute ranked reports five ways:

News: primarily reporting the "what, where, who, when and why" of an event;

Peripheral: primarily providing insignificant background information or color not necessary to an understanding of the "news" or contributing to the viewer's "perspective" on the risks and benefits of nuclear power;

Perspective: primarily providing factual explanatory information to help the viewer understand the significance of the "news" and upon which rational judgments on the risks and benefits of nuclear power can be based;

News/Peripheral: evenly balanced between "news" and "peripheral" information;

News/Perspective: evenly balanced between "news" and "perspective" background information.

In the period before Three Mile Island, there were 383 separate reports within the 348 nuclear power stories, according to the Institute's analysis. "News" reports, 297 in all, were the highest percentage, 77%. "Peripheral" and "News/Periph-

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eral" reports totalled 58 or 15%. There were 20 "News/Perspective" reports, 5% of the total. Just 9 stories, 2%, were judged "Perspective" over the period.

Following the Three Mile Island accident, "News" reports accounted for 67% of the total, "Peripheral" and "News/Peripheral," 18%, and "Perspective" and "News/Perspective," 16%.

Three Mile Island Content Analysis, March 28-April 20, 1979

Total stories: 121
Total reports: 178

Period	News	News/Peripheral	Peripheral	News/Perspective	Perspective
3/28-3/29 (The accident)	13 (59%)	2 (9%)	2 (9%)	4 (18%)	1 (5%)
3/30-4/5 (Hydrogen bubble)	75 (65%)	6 (5%)	14 (12%)	17 (15%)	4 (3%)
4/6-4/20 (Plant shutdown)	47 (71%)	5 (8%)	8 (12%)	3 (4.5%)	3 (4.5%)
Totals	135 (67%)	13 (7%)	23 (11%)	24 (12%)	8 (4%)

C. Ninety-four percent of the coverage of nuclear energy in the 10 years 8 months prior to the Three Mile Island accident appeared in the last two thirds of the evening news broadcast.

The first 10 minutes of a network evening news program constitute its "front page": the most important stories almost invariably are used there. The middle one-third is used for news of secondary importance while the last portion is where features and less important stories usually appear.

In the years 1969 through 1973, stories on nuclear energy ended up in the third segment of the program, on the average. In the years 1976 until the Three Mile Island accident on March 28, 1979, most nuclear energy stories were in the middle segment of the news programs.

By contrast, the average story placement in the period following Three Mile Island was in the first two-thirds of the newscast, although actual story placement varied greatly.

D. Nearly half the pre-Three Mile Island stories were covered entirely by the anchorman or a reporter in the network's main studio.

One measure of the importance a news organization gives to a story is the amount of time and resources devoted to gathering facts and information. At least from what appeared on the screen to the viewer, half the pre-Three Mile Island coverage consisted of straight narrative reports without any apparent out-of-studio "field reporting" contributing to the story. CBS originated 56% of its stories without apparent field reporting, followed by 43% by ABC. NBC utilized the most field reports: 64% of its stories on nuclear energy.

Following Three Mile Island, field reports were used in 75% of the stories. During this period, from March 28 to April 20, 1979, CBS had the most field reports (80%), followed closely by NBC (79%). ABC had field reports in 66% of its stories during the period. In the first two days after the accident, every story included field reports. In the seven days during which a hydrogen bubble in the reactor room posed a safety threat, stories which included field reports dropped somewhat, to 83%. For the final 15 days until the plant was shut down, stories which included field reports dropped again to 62% of the total number devoted to the subject.

E. Average length of stories on nuclear power generation before Three Mile Island was just over one minute; following the accident, the average rose to more than two minutes per story.

As another measure of the importance network news staffs placed on the nuclear power generation issue, before and after the accident at Three Mile Island, The Media Institute computed the mathematical average length of all stories run, (the "mean" length).

In most years prior to the Three Mile Island accident, the average length of stories was just over one minute.

Following Three Mile Island, story length jumped to an average of just under three minutes.

F. Lead-ins and closings of network evening news stories on nuclear power generation introduced a bias in over 18% of the stories before Three Mile Island and more than half the time during coverage of the accident.

The introduction of a television news story is something like the headline in a newspaper or magazine: it aims to attract attention and set the tone for the story which is to follow.

News reporters say they strive to be objective in covering news events. But the mind-set within which the television viewer will receive a given story can be affected by the way it is introduced.

81.6% Objective

For the period studied prior to Three Mile Island, The Media Institute classified 81.6% of the story openings as neutral or objective. However, the remaining 18.4% of the stories were introduced by statements which the Institute believed used biasing words not supported by facts brought out in the stories. Of these, 17% were considered against nuclear energy and 1.4% were positive.

During Three Mile Island coverage, March 28 to April 20, 1979, neutral or objective opening statements were only 47% of the total. Opening statements with a negative tone also totalled 47% of the total, with only 6% of the openings considered positive

Closing statements in a television news story are often given by a reporter who has been covering the story. (Obviously, in stories which include no field reports, the anchorman gives both

the opening and closing lines.)

The closing lines are as important as the introductions in influencing the viewer reception and perception of the story just completed.

Prior to Three Mile Island, closing lines were neutral or objective 86.7% of the time. Of the remaining closings, 11.7% were considered to introduce an anti-nuclear bias not supported by facts in the story and 1.2% a positive bias.

In the post-Three Mile Island coverage studied, neutral statements were used to close just 52.3% of the stories with negative endings on 46.4% of them. Positive endings occurred on 1.2%.

G. A majority of the top ten individuals or groups whose opinions, observations and statements were used within network evening news stories were against nuclear power or critical of safety procedures at Three Mile Island facility.

In the pre-Three Mile Island period studied, numerous individuals or groups either appeared within stories or were quoted or referred to by reporters covering a story. The ten "outside sources" whose combined statements and quotes utilized the most total time were ranked by The Media Institute as either being in favor of nuclear power generation or against it.

These ten were allotted a total of 28 minutes, 22 seconds. Those against nuclear power accounted for 20 minutes, 28 seconds, or 72% of the time.

Four different "outside sources" had provided information which totalled 58% of all that derived from the "top ten". The Union of Concerned Scientists (6:18), Ralph Nader (3:34), the Atomic Industrial Forum (3:26) and Commonwealth Edison of Chicago (3:08). The first two are considered anti-nuclear, the latter two pro-nuclear.

The top ten "outside sources" on nuclear energy from August 4, 1968 to March 27, 1979, together with their position, anti (−) or pro (+) and total appearance time:

1. Union of Concerned Scientists (−) (6:18)
2. Ralph Nader (−) (3:34)
3. Atomic Industrial Forum (+) (3:26)
4. Commonwealth Edison of Chicago (+) (3:08)
5. Critics, Environmentalists, "Experts" Scientists (not specified) (−) (2:57)
6. Dr. John Gofman (research biophysicist) (−) (2:14)
7. National Resources Defense Council (−) (1:58)
8. David Comey (−) (1:50)
9. Dr. Theodore Taylor (−) (1:37)
10. Consumer's Power of Michigan (+) (1:20)

After the Three Mile Island accident, the theme of the statements of "experts" and other "outside sources" of information changed from being "pro" or "anti" nuclear to criticism or defense of safety regulations and procedures at the plant and whether they had been followed. Most of these whose statements or opinions appeared on the screen were critical. But just under half the total time for the top ten whose statements were used was neutral or defensive, led by the federal Nuclear Regulatory Commission (8:32) and the utility involved, Metropolitan Edison (4:43). The top ten outside sources on nuclear energy on the basis of total time, from March 28 to April 20, together with their position: (C=Critical; D=Defensive; N=Neutral)

1. Nuclear Regulatory Commission D/N (8:32)
2. Metropolitan Edison D (4:43)
3. U.S. General Accounting Office C (3:29)
4. Senator Gary Hart (D-Colo.) C (2:11)
5. Senator Richard Schweiker (R-Pa.) C (1:41)
6. Dr. Ernest Sternglass (Radiologist) C (1:27)
7. Union of Concerned Scientists C (1:03)
8. Senator Henry Jackson (D-Wash.) N (0:48)
9. Pennsylvania Consumer Advocate's Office C (0:48)
10. Atomic Industrial Forum D (0:39)

Although the viewer probably had no trouble in discerning the opinion of the outside sources whose statements were used within stories on nuclear energy, the credentials of the person or group were more difficult to determine. Therefore, the viewer was given no basis upon which to judge the validity of the opinion or observation.

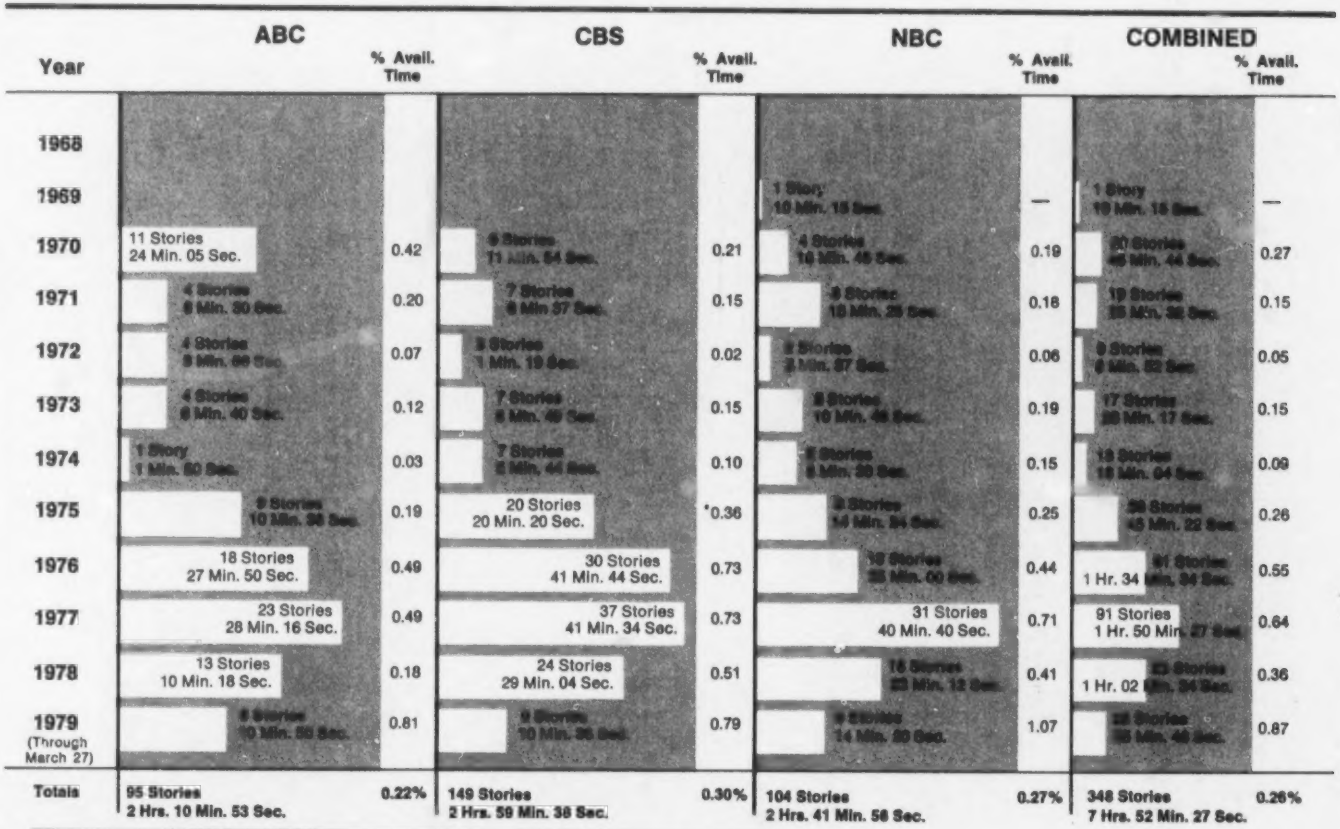
For example, the Union of Concerned Scientists was the most quoted group in the decade before Three Mile Island. A story on ABC on July 26, 1971 began: "The Union of Concerned Scientists got together in Cambridge, Massachusetts, today and said the Atomic Energy Commission should stop licensing nuclear reactors for making electricity and should review their safety rules." NBC news carried a nearly identical item the same evening. Yet in neither case was the viewer given a clue as to who these "concerned scientists" were, what their possible bias might be or the basis of their authority to make such a serious charge, valid or not.

CBS carried a statement from the Union of Concerned Scientists on March 31, 1979, three days following the Three Mile Island accident, calling for the evacuation of the area around the plant. Again, there was no identification of the group or the basis upon which its recommendation was being made. CBS simply referred to the Union as "an organization of nuclear critics."

Although it is difficult to compute the degree to which sources, experts and observers are inadequately described in network evening news broadcasts, The Media Institute believes that the identification of the background, qualifications and possible bias of any expert or authority cited or quoted may be almost as important as the statement itself, in order for an average viewer to judge the merit of arguments for and against nuclear energy.

Table S-1

Coverage of Nuclear Energy, August 5, 1968 – March 27, 1979



Total Available Time: 182,688 Minutes (22-minutes per broadcast)

THE PUBLIC'S RIGHT TO KNOW: COMMUNICATORS' RESPONSE TO THE KEMENY COMMISSION REPORT

A Survey by

The Media Institute

the media institute

The Media Institute is a nonprofit, tax-exempt organization headquartered in Washington, D.C. Its objective is to improve the level and quality of media coverage of business and economic affairs. To that end, it prepares studies related to news coverage of major issues as a public service.

This survey was made possible only through the generous cooperation of members of the news media, the nuclear industry and utilities and officials of state and federal governments. Heartfelt thanks go out from The Media Institute to all those who responded to the survey questionnaire. It is hoped that the information contained in this monograph will serve these parties well, and will stimulate the kind of interest and care that can preserve the public's right to know.

Special thanks are directed to the many researchers who participated in this project; in particular, James C. Brennan, Byron K. Callan, Arnold D. Cohen, Laura Datlow and Daniel B. Haslam.

Francis J. Skrobiszewski
Deputy Director
The Media Institute

I. INTRODUCTION

The finest and worst features of modern mass communications are magnified in crisis situations. The near instantaneous transmission of news can provide essential life-saving information that aids, alerts, or reassures the public; alternatively, the public can be misinformed, terrified, even panicked by information that is inadequate or distorted. The quality of the news during a crisis is largely contingent on the manner in which the information is generated.

The March 28, 1979 accident at Three Mile Island provided a unique opportunity for studying the flow of information in a crisis, and was particularly instructive in that it involved the interaction of the mass media, American industry and state and federal government. The incident has rightly attracted extensive scrutiny, varied in focus, but universally intended to ensure that the lessons not be lost. Only through conscientious and considered analysis can there be any guarantee that the same problems and mistakes will be avoided in the future.

The Media Institute has completed two previous studies of nuclear energy coverage on television network news. "Television Evening News Covers Nuclear Energy: A Ten Year Perspective" concluded that television network news supplied insufficient information for a viewer to reach a reasoned decision and was biased against nuclear power. "Nuclear Phobia — Phobic Thinking About Nuclear Power: A Discussion with Robert L. DuPont, M.D." explained how television news broadcasts were creating a phobic, irrational mentality in the viewing public. The subject of this study is the reception given the Report of the President's Commission on The Accident at Three Mile Island (called the "Kemeny Commission Report") by the groups that were the subject of its scrutiny — the news media, utilities and state and federal government.

In contrast to the emotionalism that characterized much of the news coverage of Three Mile Island, the Kemeny Commission's Report analyzed the accident soberly and carefully. Some of its most interesting findings pertained to the conduct of each of the groups involved in the news process, and the extent to which the public's right to know was well or poorly served during and subsequent to the accident. On the basis of its findings, the Kemeny Commission made a number of recommendations intended to improve the information process in the event of another nuclear-related accident.

The Media Institute conducted an informal survey to ascertain how each of the groups involved in the accident's news process viewed the findings, recommendations and feasibility of the Commission's Report. In particular, the survey was designed to:

a) Determine the degree to which representatives of the news media, the nuclear industry, utilities and the state and federal governments were familiar with specific sections of the Report dealing with the "Public's Right to Information";

b) Determine how the media, the state and federal governments and the utilities felt about the Kemeny Commission findings regarding public information provided at Three Mile Island;

c) Find out whether affected groups believed that the Kemeny Commission recommendations concerning the handling of information during a nuclear power accident could be feasibly implemented; and

d) Ascertain whether, in the event of a future nuclear power accident, the public's right to know would be better served than it was at Three Mile Island.

It is hoped that the findings of the survey will encourage all groups involved to re-evaluate their procedures for dealing with the flow of information during a crisis and to take steps to implement the recommendations of the Kemeny Commission.

II. CONCLUSIONS OF THE MEDIA INSTITUTE

The Media Institute Survey of Communicators' Response to the Kemeny Commission Report found that, while the Report failed to reach significant portions of the relevant audience, particularly among the news media, it was well received. Its recommendations are generally viewed as feasible and are being followed to a limited extent.

In the year following the Three Mile Island nuclear accident, the news media, utilities and the government have taken steps to ensure that the public will be provided with more timely, accurate and informative news in the event of another nuclear power emergency. There is widespread recognition that the provision, conveyance, and reporting of information during the accident were seriously flawed, and as a result, a heightened sensitivity to the public's right to know has inspired extensive efforts at improvement. However, much of this progress is in direction and attitudes, and has yet to reach the operational stage of preparation recommended by the Kemeny Commission. In addition, there remain some major problems both in the low level of preparation among some electronic news media and in the unresolved question regarding a primary spokesman.

One of the more disturbing findings of the survey is that the entire Three Mile Island episode seems to have had little impact on some quarters of the media. The Kemeny Commission Report has not been widely read among most segments of the media. The full report has been read by only 8% of the news media respondents (newspapers, 17%; television network affiliate stations, 7%; radio stations, 6%). The portions pertaining to the "Public's Right to Information" has been read by 61% of the news media respondents (television network affiliates, 79%; radio stations, 50%; newspapers, 45%). However, fewer than half of the news media respondents indicated that they were aware of the Kemeny Commission recommendations directed at their profession.

A lack of interest bordering on apathy also seemed to be indicated among some news media groups, judging by the level of response that The Media Institute's survey received. While 53% of non-media communicators responded, the response rate overall from the news media was only 33%. No response came from the national news magazines. Only one response, of 50 solicited, was received from national television network news personnel, and the response rate from independent television stations was only 17%. While such meager response precludes specific conclusions, it seems evident that Three Mile Island, its aftermath, and the "Public's Right to Information" are not of compelling interest to these news media.

The great majority of respondents who were aware of the Kemeny Commission findings agreed with the Commission's evaluation of the quality of information distributed by the parties involved in the information process at the Three Mile Island accident. Furthermore, the Commission's recommendations with respect to the "Public's Right to Information" were generally well received.

Of the government agency and utility respondents familiar with the recommendations, 93% felt those recommendations could be implemented by their organizations (utilities, 100%; state government, 86%; NRC, 75%). It is unfortunate that fewer than half of the news media respondents were aware of the Kemeny Commission recommendations addressed to their profession, but 82% of those who did know the recommendations felt that they could be implemented by their respective organizations (television network affiliate stations, 90%; radio stations, 75%; newspapers, 67%).

One of the most important revelations of The Media Institute's survey is the current status of efforts aimed at improving the quality of information in the event of a nuclear power-related accident. In general, the results of the survey indicate that the utilities, the government, and the news media have taken action to ensure that a flow of timely and accurate information will reach the public if such a crisis should occur again. However, the degree of change has not been uniform, and much remains to be done.

Most of the actions taken in response to Kemeny Commission recommendations fall somewhere between a basic recognition of the problem and the full implementation and testing of emergency information systems. The vast majority of government agencies and utilities that responded have refined their emergency information response plans (NRC, 100%; FEMA, 100%; state government, 83%; utilities, 75%).

An overwhelming majority (95%) of news media respondents expressed a willingness to attend seminars covering the technical fundamentals of nuclear power generation (newspapers, 100%; radio stations, 97%; television network affiliate stations, 89%). Of the news media respondents, 52% reported having designated a person on their news staff to cover nuclear power issues. Among the media, however, implementation of this important reform varied greatly, with newspapers, 91%; television network affiliate stations, 55%; and radio stations only 34%.

This serves to illustrate one of the major disappointments in the media response to the problems of information flow which the Three Mile Island accident brought to the fore: those news media that seem to have made the fewest improvements are the very ones most crucial in a crisis situation. The Kemeny Commission's Task Force on the Public's Right to Information stated that,

> *Local radio was the single most important source of information about the accident at Three Mile Island for the people of Dauphin, Lancaster, and York counties . . . sixty-two percent of local residents cited radio as their "most frequent source of news" during the accident.*[1]

The Task Force Report quotes a local radio news director who comments that radio assumes this importance because television is unlikely to interrupt regular programming and "you can't wait until the newspaper comes out; you're panicked now."[2] The Commission concluded that radio is of very real importance as a disseminator of information during a nuclear power mishap.

And yet, by a variety of measurements taken by the Institute's survey, the evidence indicates that radio stations have been among the least responsive to the need for change. Only 6% of radio respondents had read the full Report, only 33% had read the sections pertaining to the "Public's Right to Information." Undoubtedly due to the small size of most radio news staffs, few stations had designated an expert.

The same low level of improvement is evident, to varying degrees, in a number of the electronic media groups, the media most important to the public during a crisis. While newspapers were perhaps the best prepared medium, they are arguably the least important in a crisis. Overall, then, the media have made important efforts aimed at improving the information they gather and report, but closer analysis indicates that the actual situation is considerably less encouraging.

The question of a primary spokesman in a radiation-related crisis raises a wholly different set of complex considerations. There is little agreement on the subject of who should be the primary spokesman in a nuclear power mishap. One-third of the survey respondents opted for a combination or platform of speakers drawn from the NRC, government and the utility. Twenty-eight percent thought the NRC should be the primary spokesman. The remaining 40% of the respondents were more or less equally divided between the state, the government and the utility as the designated primary spokesman.

The divergence of opinion, however, is even more striking when the different groups are considered separately. The single most popular choice of primary spokesman for the state government respondents was the state, for the utilities was the utility, and for the media was the NRC. Yet not a single NRC respondent thought that the NRC should be cast in that role.

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[1]Report of the Public's Right to Information Task Force to the President's Commission on the Accident at Three Mile Island, October 31, 1979, page 290 (hereinafter called Task Force Report).

[2]Ibid.

Moreover, even the studies are divided on the question. The report by a special inquiry group of the NRC (known as the Rogovin report, after its director, Mitchell Rogovin) recommended that the NRC be the primary spokesman.[1] By contrast, the Kemeny Commission proposed that the utility be responsible for providing the public relevant information concerning radiation-related accidents, with additional questions being directed to the NRC.[2]

The states of Vermont, Colorado and Illinois have established a specific spokesman, or platform of spokesmen. The question of primary spokesman, however, is unresolved in most jurisdictions and should be considered one of the major weaknesses in the present level of preparedness. There is little indication that this aspect of the information flow would be handled any better at present than it was at Three Mile Island.

It is not possible to make any unequivocal prediction on the quality of information that would be disseminated in the event of another nuclear power emergency. The Media Institute asked only about organizational changes; the news media may designate reporters to develop an in-house expertise on nuclear power, but this does not necessarily mean that coverage will be more accurate or less speculative. Likewise, the utilities and government agencies may possess plans, but the existence of emergency information plans or policies does not necessarily guarantee that these plans or policies will be followed during a crisis situation.

The Institute's survey revealed that the structure for better dissemination of information is at least being developed and that some reporters have sought to develop a modicum of expertise in nuclear power generation; however, the kind of information that will be distributed to the public is beyond the scope of this study. The survey does indicate that there now exists a recognition of the problems, a widespread interest in improvement, and a spirit of concern. As one official of a state disaster preparedness agency confided in his survey response,

> *No other aspect of our Emergency Response Plan has given me more trouble than that portion dealing with public information . . . If a serious accident were to occur at or around [this state], in my judgment, ninety-five percent of the problems generated therefrom would entail public information. Yet what we plan for in regard to public information is only a very small portion of the total plan. It is difficult to generate a sense of urgency in this matter. But we will continue trying.*

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[1]Three Mile Island: A Report to the Commissioners and to the Public, pages 156-7.

[2]Kemeny Commission Report, page 78.

III. THE KEMENY COMMISSION REPORT*

In April 1979, two weeks after the accident at Three Mile Island, President Carter ordered the establishment of a commission (now known as the Kemeny Commission after its chairman, John Kemeny) to investigate the causes and course of the mishap.

Included in its overall investigative responsibilities, the Kemeny Commission was to make:

> *(e.) an assessment of how the public's right to information concerning the events at Three Mile Island was served and of the steps which should be taken during similar emergencies to provide the public with accurate, comprehensible and timely information; and*
>
> *(f.) appropriate recommendations based upon the Commission's findings.*[1]

After five months of study, the Commission made public its findings and recommendations. It observed in general that informing the public of radiation-related accidents required special treatment. Unlike other crisis situations in which the public already has a basic understanding of the kind of danger or harm to expect, nuclear energy and radiation dangers remain fear-evoking unknowns. Radiation is a hazard which cannot be heard, smelled, or seen. In most people's minds, nuclear power accidents are invariably associated with Hiroshima and Nagasaki.

Because of the very deep-rooted fear engendered by nuclear power and radiation, the Kemeny Commission stressed that government, utilities and the news media should make extraordinary preparation for the accurate and sensitive handling of information on this subject. As the Kemeny Commission noted, significant advance preparation can, in the event of any future accident, allay this very real public fear.

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*Report on the President's Commission on the Accident at Three Mile Island, October 31, 1979 (hereinafter called the Kemeny Commission Report). It should be noted that the Kemeny Commission studied and investigated numerous aspects of the accident at Three Mile Island including, among other things, technical problems, the role of the utility, and the Nuclear Regulatory Commission's procedures regarding licensing and inspections. This study focuses primarily on the "Public's Right to Information" portions of the Report.

[1]Kemeny Commission Report, page 1.

1. An Overview

In its assessment of mass communications at Three Mile Island, the Commission's Report did not discover any evidence of an intentional cover-up by Metropolitan Edison (the utility operating Three Mile Island) or by the federal and state government agencies, nor did it substantiate in most cases the charge that the news media had purposely distorted and sensationalized the accident.

In a supplemental minority view, however, Commission-member Anne Trunk took issue with the Commission's Report and observed the following about media coverage at Three Mile Island:

> *The report concluded that the errors and sensationalism reported by the news media merely reflected the confusion and ignorance of the facts by the official sources of information. It further concluded that the press did a creditable ("more reassuring than alarming") job of news coverage.*
>
> *In fact, these conclusions are not generally supported by the staff reports. There were reliable news sources available. Too much emphasis was placed on the "what if" rather than the "what is." As a result, the public was pulled into a state of terror, of psychological stress. More so than any other normal source of news, the evening national news reports by the major networks proved to be the most depressing, the most terrifying. Confusion cannot explain away the mismanagement of a news event of this magnitude.*
>
> *It is requested that the news media undertake a self evaluation on an individual basis and review their role in this accident which was not limited to equipment damage but also included psychological damage.*[1]

The Kemeny Commission found the greatest hindrance to the public's accurate understanding of events at Three Mile Island was that

> *[t]here were serious problems with the sources of information, with how this information was conveyed to the press, and also with the way the press reported what it heard.*[2]

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[1]Supplemental View By Commissioner Trunk, October 25, 1979, page 18.

[2]Kemeny Commission Report, page 18.

The Commission recognized that during a disaster, personnel involved in managing the disaster have a great deal of difficulty in concentrating on their vital tasks and at the same time keeping the public informed, but that

> *significant advance preparation can alleviate the problem. It is our judgment that in this case, neither the utility nor the NRC nor the media were sufficiently prepared to serve the public well.*[1]

During the crisis, the news media received what was often conflicting information from the Nuclear Regulatory Commission (NRC), the Pennsylvania state government, and Metropolitan Edison. Because of the lack of information exchanged between the various news sources, contradictory statements on conditions at the reactor site were often issued, which, transmitted by various news media groups, compounded the public confusion. For example, at one point during the crisis a Metropolitan Edison official stated that a radiation release was measured at 300 to 350 millirems per hour. Earlier the same day the NRC had stated that this same release measured approximately 1200 millirems per hour.

Information released to the press often was "couched in technical jargon" of which the news media had little understanding. Few "technical briefers" — persons who could translate the technical language of the persons operating and supervising the emergency procedures at the plant into terms understood by the layman — were made available to the press by either the NRC or Metropolitan Edison.

Other problems stemming from poor coordination among information sources were somewhat eased, after the first days of the crisis, by the White House request that the NRC's Bethesda, Maryland office and Metropolitan Edison cease to provide information to the press. This move ended much of the confusion which had stemmed from different offices issuing contradictory statements. However, it violated the long tradition of the press checking facts with multiple sources.

In part, the public's right to information was not well served because Metropolitan Edison, the state of Pennsylvania and the NRC had not taken adequate steps to ensure a smooth flow of emergency information to the press, and ultimately, the public.

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[1]Kemeny Commission Report, page 19.

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Considering the news media, the Kemeny Commission cited another major problem with coverage of Three Mile Island:

> *...even personnel representing the major national news media often did not have sufficient scientific and engineering background to understand thoroughly what they heard, and did not have available to them people to explain the information. This problem was most serious in the reporting of the various releases of radiation and the explanation of the severity (or lack of severity) of these releases. Many of the stories were so garbled as to make them useless as sources of information.*[1]

The Kemeny Commission's findings of how emergency information was first distributed to the press by Metropolitan Edison and the government, and then by the press to the public, drew the Commission to conclude that:

> *while the extent of coverage was justified, a combination of confusion and weakness on the part of the sources of information and lack of understanding on the part of the media resulted in the public being poorly served.*[2]

2. Commission Findings

Having made its investigation of how the public's right to information was served at Three Mile Island, the Commission issued the following specific findings:[3]

1. *The quality of information provided to the public in the event of a nuclear plant accident has a significant bearing on the capacity of people to respond to the accident, on their mental health, and on their willingness to accept guidance from responsible public officials.*

2. *Before the accident, Met Ed had consistently asserted the overall safety of the plant, although the company had made information (sic) concerning difficulties at TMI-2 public in weekly press releases. This information was not pursued, and often not understood, by the local news media in the area; and the local news media generally failed to publish or broadcast investigative stories on the safety of the plant.*

3. *Neither Met Ed nor the NRC had specific plans for providing accident information to the public and the news media.*

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[1]Kemeny Commission Report, page 19.

[2]Ibid.

[3]Kemeny Commission Report, pages 57-58.

4. *During the accident, official sources of information were often confused or ignorant of the facts. News media coverage often reflected this confusion and ignorance.*

5. *Met Ed's handling of information during the first 3 days of the accident resulted in loss of its credibility as an information source with state and local officials, as well as with the news media. Part of the problem was that the utility was slow to confirm "pessimistic" news about the accident.*

6. *In accordance with an informal agreement worked out between Governor Thornburgh and the White House, the release of information was centralized beginning on the third day of the accident. Under the agreement, Harold Denton of the NRC would issue all statements from the site on plant status; the Governor's office would be the sole source of comment on protective action and evacuation; and the White House would coordinate comment on the federal emergency relief effort. This agreement limited the number of sources available to the news media and while it brought some order out of the chaos in public information, it raised two problems. First information on off-site radiation releases was not centralized in any source so that it would be readily available to the news media and the public; and second, the plan provided no specific public information role for the utility.*

7. *During the first days of the accident, [Babcock and Wilcox] made a conscious decision not to comment on the accident, even when company officials believed that misinformation was being made available to the public by others.*

8. *The reporters who covered the accident had widely divergent skills and backgrounds. Many had no scientific background. Because too few technical briefers were supplied by NRC and the utility, and because many reporters were unfamiliar with the technology and the limits of scientific knowledge, they had difficulty understanding fully the information that was given to them. In turn, the news media had difficulty presenting this information to the public in a form that would be understandable.*

   a. *This difficulty was particularly acute in the reporting of information on radiation releases.*

   b. *They also experienced difficulty interpreting language expressing the probability of such events as a meltdown or a hydrogen explosion; this was made even more difficult when the sources of information were themselves undertain about the probabilities.*

9. *The impression exists that in news coverage of the accident, the news media presented a more alarming than reassuring view of events. Without attempting to assess how alarming the accident may in fact have been, an analysis of the sources quoted in the news media reveals, overall, a larger proportion of reassuring than alarming statements in the coverage concerning the status of the accident. In choosing quotations from both official and unofficial sources, the news media did not present only "alarming" views, but rather views on both sides of issues related to the accident.*[1]

10. *A qualitative survey of 42 newspapers from around the country showed that the vast majority covered the accident in much the same way as the major suppliers of news, such as the wire services, the broadcast networks, The New York Times, and The Washington Post. A few newspapers, however, did present a more frightening and misleading impression of the accident. This impression was created through headlines and graphics, and in the selection of material to print.*

3. Commission Recommendations

In an attempt to ensure that the public will be better informed in the event of any future nuclear power accident, the Kemeny Commission made the following recommendations:[2]

1. *Federal and state agencies, as well as the utility, should make adequate preparation for a systematic public information program so that in time of a radiation-related emergency, they can provide timely and accurate information to the news media and the public in a form that is understandable. There should be sufficient division of briefing responsibilities as well as availability of informed sources to reduce confused and inaccurate information. The Commission therefore recommends:*

    a. *Since the utility must be responsible for the management of the accident, it should also be primarily responsible for providing information on the status of the plant to the news media and to the public; but the restructured NRC should also play a supporting role and be available to provide background information and technical briefings.*

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[1]The reader should note that this finding is not in consonance with findings of The Media Institute with respect to television news coverage. See, "Nuclear Phobia — Phobic Thinking About Nuclear Power," and "Television Evening News Covers Nuclear Energy."

[2]Kemeny Commission Report, pages 78-79.

b. *Since the state government is responsible for decisions concerning protective actions, including evacuations, a designated state agency should be charged with issuing all information on this subject. This agency is also charged with the development of and dissemination of accurate and timely information on off-site radiation doses resulting from releases of radioactivity. This information should be derived from appropriate sources. This agency should also set up the machinery to keep local officials fully informed of developments and to coordinate briefings to discuss any federal involvement in evacuation matters.*

2. *The provision of accurate and timely information places special responsibilities on the official sources of this information. The effort must meet the needs of the news media for information but without compromising the ability of operational personnel to manage the accident. The Commission therefore recommends that:*

   a. *Those who brief the news media must have direct access to informed sources of information.*

   b. *Technical liaison people should be designated to inform the briefers and to serve as a resource for the news media.*

   c. *The primary official news sources should have plans for the prompt establishment of press centers reasonably close to the site. These must be properly equipped, have appropriate visual aids and reference materials, and be staffed with individuals who are knowledgeable in dealing with the news media. These press centers must be operational promptly upon the declaration of a general emergency or its equivalent.*

3. *The coverage of nuclear emergencies places special responsibilities on the news media to provide accurate and timely information. The Commission therefore recommends that:*

   a. *All major media outlets (wire services, broadcast networks, news magazines, and metropolitan daily newspapers) hire and train specialists who have more than a passing familiarity with reactors and the language of radiation. All other news media, regardless of their size, located near nuclear power plants should attempt to acquire similar knowledge or make plans to secure it during an emergency.*

b. *Reporters discipline themselves to place complex information in a context that is understandable to the public and that allows members of the public to make decisions regarding their health and safety.*

c. *Reporters educate themselves to understand the pitfalls in interpreting answers to "what if" questions. Those covering an accident should have the ability to understand uncertainties expressed by sources of information and probabilities assigned to various possible dangers.*

4. *State emergency plans should include provision for creation of local broadcast media networks for emergencies that will supply timely and accurate information. Arrangements should be made to make available knowledgeable briefers to go on the air to clear up rumors and explain conditions at the plant. Communications between state officials, the utility, and the network should be prearranged to handle the possibility of an evacuation announcement.*

5. *The Commission recommends that the public in the vicinity of a nuclear power plant be routinely informed of local radiation measurements that depart appreciably from normal background radiation, whether from normal or abnormal operation of the nuclear power plant, from a radioactivity cleanup operation such as that at TMI-2, or from other sources.*

. . .

The Kemeny Commission investigation, conducted in a thorough and conscientious manner, confirmed that news media coverage of the Three Mile Island accident confused more than clarified. The media, however, were not solely responsible, as the public information debacle at Three Mile Island was partly a function of confusion and lack of preparation by those who provided information to the news media — the utility, the state government and the NRC.

The recommendations of the Commission, developed after extensive consultation with relevant parties and experts, can provide a blueprint for improvements in nuclear energy-related news coverage. Change, however, cannot be imposed by the Kemeny Commission. Rather, it must come from within.

The perceptions of the "insiders" — the news media, federal and state government and industry — regarding the accuracy of the Commission's findings will indicate whether there is agreement on the problems that existed at Three Mile Island. The reception accorded the Commission's recommendations, and their perceived feasibility, is the ultimate basis on which the Kemeny Commission must be judged. The Institute's survey sought to determine the impact of the Commission's Report and the perceived feasibility of its suggestions.

IV. SURVEY METHODOLOGY

Between February 22 and 24, 1980, The Media Institute mailed 404 surveys to representatives of the following groups:

1) Federal Emergency Management Agency (FEMA) — public affairs office (1).

2) Nuclear Regulatory Commission (NRC) — national and regional public affairs offices (6).

3) State governments — press secretaries of governors in those states which have an operational commercial nuclear power reactor (as opposed to research reactors or reactors under construction) (28).

4) All utilities in the United States currently operating a commercial nuclear power reactor — public affairs offices (35).

5) Reactor manufacturers — public affairs offices (5).

6) Radio stations located near commercial reactors — station news directors (59).

7) Television network affiliate (127) and independent stations (54) located near commercial reactor sites — news directors.

8) National television network news executives, correspondents, and bureau assignment desks (50).

9) Newspapers — energy reporters and editors (27).

10) Wire services — energy reporters (2).

11) National news magazines — energy reporters (10).

For the broadcast media — television and radio stations — a list of contacts was compiled from the Broadcasting Yearbook 1979.

Radio stations were selected on the basis of AM wattage, presence of a full-time news staff, and proximity to a commercial reactor. Generally, radio stations that were located nearest the reactor site were sent surveys. There were some instances, however, where all-news radio stations located in major cities near reactors were included in the distribution list.

Surveys were directed to all network affiliate and independent television stations that were within a fifty-mile radius of a commercial reactor. It was assumed that television stations that were more than fifty miles from the reactor would rely on news feed from local stations or from national networks.

Surveys were directed to selected "national" and "regional" newspapers in major population centers. National papers included, for example, The New York Times, The Los Angeles Times, The Washington Post, and Chicago Sun-Tribune. Regional papers included, for example, the Sacramento Bee, the Milwaukee Journal, the Pittsburgh Press, and the New Orleans Times-Picayune. National News magazines included, for example, Time, Newsweek and U.S. News and World Report.

During March 4 - 17, 1980, a telephone follow-up was made to contact those persons who had not yet returned a survey. As of March 20, 1980, The Media Institute had completed surveys, by mail or telephone from 149, or 37%, of the original contact group.

The survey response rate among individual groups was as follows:

		(Responses/Sample)
FEMA	100%	(1/1)
NRC	67%	(4/6)
Radio Stations	61%	(36/59)
Reactor Manufacturers	60%	(3/5)
Utilities	57%	(20/35)
Wire Services	50%	(1/2)
Newspapers	44%	(12/27)
State Governments	43%	(12/28)
TV Network Affiliate Stations	39%	(49/127)
Independent TV Stations	17%	(10/54)
Major News Networks	2%	(1/50)
National News Magazines	0%	(0/10)

The survey data for the media category suffers a minor deficiency due to the lack of participation by two key segments of the news industry — the major networks and the national news magazines. Only one television correspondent of 50 representatives solicited among the major networks cooperated in the survey effort. Likewise, a relatively small number of independent television stations responded to the Institute's survey. Considering that an even smaller number of such respondents answered individual questions, it is difficult to make conclusive statements regarding independent television stations. Accordingly, much of the survey data, findings and conclusions relating to the media as a whole are derived from the newspaper, television network affiliate and radio station respondents.

It should be noted that The Media Institute's survey was not intended to be a scientific survey; it is more in the nature of a sampling.

In the findings that will follow, the results of various survey questions are tabulated. As a guide to understanding the figures shown, the reader should observe that the numerals in parentheses represent the raw number of respondents who answered a particular question. These figures are provided to avoid any misinterpretation or over-reliance on the percentages provided.

The reader should observe that the second figure of each pair does not always equal the total number of respondents in a particular group, because rarely did all the respondents answer every question directed to that group. Thus, the percentage figures apply only to the specific question under consideration and must be read with this fact in mind. One can only guess the preferences of those who chose not to answer a particular question.

A good example can be found in the responses of the radio station representatives. Thirty-six out of 59, or 61%, responded to the survey. However, only 14, answered Question 5 regarding the Commission's recommendations. Six of these, or 43%, did not know the Commission's recommendations directed to their organizations. It is impossible to estimate how many of the 22 respondents who failed to answer Question 5 chose to abstain because they too did not know the recommendations.

V. FINDINGS OF THE MEDIA INSTITUTE'S SURVEY

1. News Media

Considering the media groups as a whole, one finds a relatively low response rate, as only 33% (108/329) of the media representatives contacted responded to the survey. The findings that follow are divided according to the response for each individual media group.

a. Television Network Affiliate Stations

Thirty-nine percent (49/127) of the original sample of television network affiliate stations responded to The Media Institute's survey. Of this group, 55% (27/49) reported that they have assigned a staff member to cover nuclear power issues, while 83% (30/36) of those persons so designated have sought to develop an understanding of nuclear power generation.

Generally, the designee relied on a balanced spectrum of sources. Eighty-five percent (23/27) have contacted experts. Of these, the bulk (67%; 15/23) looked to utilities. Twenty-two percent (5/23) and 26% (6/23) have contacted, respectively, the NRC and academics. Only 4% (1/23) have sought out anti-nuclear advocates. Forty-one percent (11/27) stated that they have attended seminars, with 50% (5/11) of these seminars having been conducted by the utility, 33% (4/11) by universities and 17% (2/11) by the press. Seventy percent (19/27) have also read relevant articles, books and essays, but no particular source predominated.

When asked to name 3 persons or organizations the respondent would consult to develop a better understanding of nuclear power, results similar to the foregoing were obtained, except that anti-nuclear groups faired better. The potential sources of expertise were as follows: utilities, 74% (25/34); federal government, 56% (19/34); anti-nuclear advocates, 26% (9/34); universities, 24% (8/34); reactor manufacturers, 9% (3/34); state agency, 9% (3/34); and science or health groups, 6% (2/34). While 57% of the respondents cited publications, no single publication predominated, although NRC publications and magazines such as Newsweek, Time and Scientific American were specifically mentioned more than other reports, books and newspapers.

Only 7% (3/46) of the network affiliate respondents have read the full Kemeny Commission Report, but 49% (19/24) have read the portions of the Kemeny Commission Report pertaining to the "Public's Right to Information."

Table 1 details how the television network affiliate station respondents reacted to the Kemeny Commission findings regarding each of the groups listed.

TABLE 1*

	N=12 RM	N=14 Utility	N=12 NRC	N=12 State	N=16 Media
Agree KC	17% (2)	57% (8)	58% (7)	25% (3)	50% (8)
Disagree KC	8% (1)	7% (1)	8% (1)	8% (1)	31% (5)
Uninformed	75% (9)	36% (5)	33% (4)	58% (7)	19% (3)

*Tables 1 through 7 are based on the responses of the various groups to Question 4 of The Media Institute's survey. The "N" found in the tables refers to the number of respondents to Question 4 who answered that question with respect to each group listed. The full text of the question is as follows:

4. The Kemeny Commission made findings pertaining to "The Public's Right to Information" with respect to the performance of certain groups during the Three Mile Island accident. Check the item in each column below which most closely represents your opinion about the performance of the following groups:

	Reactor Manufacturer	*Utility*	*NRC*	*State Gov't*	*Media*
I agree w/ Kemeny Comm	____	____	____	____	____
I disagree w/ Kemeny Comm	____	____	____	____	____
I am uninformed on Kemeny Comm findings	____	____	____	____	____

While a 53% (10/19) majority of television network affiliates agreed that their stations could implement the Kemeny Commission's recommendations, it is significant that another 42% (8/19) of the respondents did not know whether such recommendations were feasible.

As many as 89% (41/46) of the TV network affiliates replied that they, or someone from their station, would be willing to attend seminars on the basics of nuclear power generation. Many added, though, that these seminars ought to be located near their workplace and scheduled at convenient times.

Ninety-eight percent (47/48) could name the nearest nuclear reactor. A slightly smaller number — 87% (34/39) — noted that they had visited it or some other reactor.

Of the television network affiliate news spokesmen who answered the question of who should be the primary spokesman, the NRC ranked first with 46% (18/39) followed by equal numbers choosing the utility and state government, 13% (5/39), respectively, and the remaining 28% (11/39) choosing "other." Most of those who chose "other" felt that the primary spokesman should be a combination of the state, the utility, and/or the NRC.

b. Newspapers

Newspaper groups in the sample were much more prepared than the electronic media to deal with issues involving nuclear power generation. The large news staffs of the papers within the survey responded that reporters could be assigned areas of specialization. This contrasts with the smaller staff size of radio stations and TV network affiliate respondents, which do not allow as great a degree of subject specialization.

Forty-four percent (12/27) of the newspaper representatives in the original sample group responded to the survey. Nearly all of those who replied -- 91% (10/11) — noted that their newspaper had designated a person to cover nuclear power issues. Of those who answered the question of whether or not that person had developed an understanding of nuclear power generation, the same number, not surprisingly, answered affirmatively.

Generally, this designated person said he or she had consulted a variety of sources from industry, the federal government, academia and anti-nuclear groups. None referred to state agencies. Three had attended seminars -- two of which were sponsored by the Atomic Industrial Forum (AIF). Five listed articles and books on nuclear power generation, but unlike the electronic news media groups, there was no mention of news magazines. Again, there was a mix of potential sources of information, but here the AIF predominated with five responses, followed by the NRC, utilities and anti-nuclear groups garnering four responses each.

Newspaper respondents unanimously stated that they or someone in their organization would be willing to attend seminars on the basics of nuclear power generation.

Only 17% (2/12) of the newspaper representatives have read the full Kemeny Commission Report; a greater number, 45% (5/11) have read the portions of the report pertaining to the "Public's Right to Information."

Table 2 details newspaper respondents' reactions to the Kemeny Commission findings pertaining to the groups listed.

TABLE 2

	N=7 RM	N=7 Utility	N=7 NRC	N=7 State	N=7 Media
Agree KC	43% (3)	29% (2)	43% (3)	29% (2)	50% (4)
Disagree KC	0	0	0	14% (1)	0
Uninformed	57% (4)	71% (5)	57% (4)	57% (4)	50% (4)

All of the newspaper respondents could name the nuclear reactor closest to their place of work. In addition, 89% (8/9) had visited this or some other nuclear power plant.

Of those newspaper respondents who expressed an opinion about who should be the primary spokesman at any future nuclear accident, 50% (6/12) chose the NRC, 8% (1/12) chose the utility, and 42% (5/12) marked "other." Those who chose "other" suggested that the spokesman should be comprised of representatives drawn from the utility, state and the NRC, or that designation of the primary spokesman should depend on the situation.

With respect to the feasibility of implementing the Kemeny Commission recommendations regarding newspapers, 63% (5/8) of the respondents to this question did not know the Commission's recommendations for their occupation. Two of the three respondents providing a "yes" or "no" answer felt that the recommendations could be implemented.

c. Radio Stations

Sixty-one percent (36/59) of radio station news directors on the mailing list responded to the survey. Of these, 34% (12/35) noted that their stations have designated a news staff member to cover nuclear power issues.

One hundred percent (12/12) of these designees have contacted experts with the vast majority again relying on utilities (92%; 11/12) and almost half of these relying solely on utilities (45%; 5/11). Equal numbers consulted the federal government and anti-nuclear groups (25%; 3/12), respectively, and reactor manufacturers and universities (8%; 1/12), respectively. Almost half of these radio station respondents relied on books and articles (42%; 5/12).

When asked to name 3 persons or organizations the respondent would consult to develop a better understanding of nuclear power, a larger sample and different mix of sources were obtained. The potential sources of information were as follows: utilities, 63% (19/30); universities, 40% (12/30); the NRC, 23% (7/30); reactor manufacturers and anti-nuclear groups, each, 17% (5/30); state government, local governments, science/health groups, each, 13% (4/30); with the federal government appearing 10% (3/30) and the press 6% (2/30) of the time. Of 11 respondents who cited potential publication sources, 54% (6/11) mentioned magazines, with Time and Newsweek predominating.

As with other media, almost all of the radio station respondents noted they would attend seminars on the fundamentals of how a nuclear powered generator works. In addition, several noted they would be more likely to attend seminars if convenient to their station.

All 35 radio news directors could name the nuclear power reactor closest to their stations, although fewer than 70% (23/33) of radio respondents have visited this or some other nuclear power reactor.

It should be noted that these figures contrast significantly with the Kemeny Commission findings about local radio coverage of Three Mile Island. Of 11 local radio news reporters interviewed by the Commission, prior to the accident "only two had even so much as taken a tour of Three Mile Island."[1] This contrast between the findings of the Commission and those of the survey seems to indicate a heightened awareness within this media group since the Three Mile Island accident.

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[1]Task Force Report, page 292.

Only 6% (2/34) of the radio station respondents have read the full Kemeny Commission report. A relatively higher percentage — 33% (11/33) — have read the portions of the report on the "Public's Right to Information." As Table 3 illustrates, most of those respondents who provided answers considered themselves uninformed on the specific findings regarding the various groups listed.

TABLE 3

	N=11 RM	N=11 Utility	N=11 NRC	N=11 State	N=14 Media
Agree KC	27% (3)	45% (5)	45% (5)	36% (4)	43% (6)
Disagree KC		9% (1)		27% (3)	7% (1)
Uninformed	73% (8)	46% (5)	55% (6)	36% (4)	50% (7)

While 43% (6/14) of the radio station respondents did not know what the Kemeny Commission recommended, 75% (6/8) of those who provided a "yes" or "no" answer to the question believed the recommendations were feasible to implement.

Radio station respondents were more divided than television network affiliates or newspapermen on the question of who should be the primary spokesman at a nuclear power accident. Twenty-seven percent (9/33) chose the NRC, 18% (6/33) chose state government; 12% chose the utility, while 42% (14/33) marked "other." Several of those who chose "other" specified that a combination of groups was best, although 1 respondent felt that the designation of a spokesman should depend on the nature and extent of the crisis.

d. Other News Media

The remaining media groups — the major news networks, wire services, independent television stations and news magazines — did not provide large enough numbers of responses to offer much insight into the actions and sentiments of these groups. It is possible, however, to outline several points raised by those responses that were received.

i. Independent Television Stations

From the 17% (9/54) of television independent stations that responded, the survey findings for this group are not encouraging. Only 1 respondent has read the "Public's Right to Information" portions of the Kemeny Commission Report. None has read the full Report, and all were uninformed on the Commission's findings and recommendations. Only two have designated an expert to deal with nuclear power issues. However, 67% (6/9) of the respondents would be willing to attend seminars and 78% (7/9) could name the closest nuclear power plant, though only 43% (3/7) have visited it.

ii. Major TV Network News Organizations

The sole respondent of 50 contacted among the three major TV networks has read the full Report, and agreed with its findings related to the 5 groups examined. However, the Commission's recommendation that the major media outlets "hire and train specialists who have more than a passing familiarity with reactors and the language of radiation" was not regarded as feasible because, as the respondent noted, "How can you find one [specialist] with the objectivity necessary even if the company were willing to spend the money?"

This respondent indicated persons covering nuclear power generation have sought to develop a better understanding by contacting experts among the NRC, the Atomic Industrial Forum (AIF), and pro- and anti-nuclear groups, and by reading magazines and newspapers. Potential sources of information mentioned included the NRC, AIF, Edison Electric Institute, Electric Power Research Institute and the Union of Concerned Scientists. The respondent would be willing to attend seminars, and had visited the nearest nuclear power plant.

iii. Wire Services

The sole wire service reporter (of two contacted) has read some portions of the Kemeny Commission Report including the section on the "Public's Right to Information." He disagreed with the Commission's findings regarding the actions of the utility and the NRC at Three Mile Island but agreed with those findings relating to the reactor manufacturer, state government and the media. The Commission's recommendations regarding the respondent's organization, however, were viewed as unfeasible.

89-459 O - 82 - 6

Persons at the wire service have been designated to cover nuclear power generation. Generally, the same experts, as was noted by the sole major network news respondent, were contacted; however publications listed included many more technical and in-depth sources, such as books and reports. Potential sources of information were similar to the ones already contacted, but experts and publications on the economic versus the technical aspects of nuclear power generation were emphasized. This respondent would not attend seminars because, he said, they were not a source of news. While the respondent has visited a nuclear power plant, access to the control room of the nearest reactor was denied him.

. . .

In addition to the sole major network respondent, several other news media respondents raised doubts about the Kemeny Commission's recommendation that they either hire an in-house nuclear specialist or designate one staff member to develop an understanding of nuclear power. The following quotes from three respondents underscore this point and others regarding access to information:

i. *Some effort needs to be made to provide the media with a clearinghouse for information. Power companies -- and anti-nuclear groups -- cannot be relied on to provide unbiased information. NRC comes closest but it has neither the time nor inclination to deal with numerous and repetitive media requests. And not every bureaucrat is as open and articulate as Harold Denton. (TV Station News Director).*

ii. *The idea that a reporter must be an expert on a subject to cover it is not correct. On the other hand . . . a reporter covering nuclear stories will often do a better job with some understanding of the subject's implications. We think the public must be kept informed . . . and that they are deserving of accurate, comprehensible and timely information during emergencies such as Three Mile Island. We encourage attendance of seminars on a wide range of subjects. However . . . don't believe they are nearly as important as on the spot TRUTH . . . or necessary to a bright reporter covering such a story who we will assume is armed with a good general understanding of nuclear [energy] . . . obtained through daily magazines, newspapers, etc. In short . . . be careful the tail doesn't wag the dog on this one! (News Director -- Network Affiliate Station).*

iii. *An unaddressed question is whether the rights of a utility are violated if the NRC pre-empts information flow at a nuclear accident, as at TMI. (Newspaper Energy Reporter).*

Utilities

Fifty-seven percent (20/35) of the utility representatives who were sent a survey responded. Seventy-five percent of these utility respondents (15/20) have taken steps to improve the manner in which information would be provided to the news media. Some of these changes within their communications systems included the designation of technical experts to deal with the news media, media centers to serve reporters and the planning of local media seminars. The remaining 25% (5/20) said no changes were made because they felt that existing systems were adequate.

However, 68% (13/19) of the utilities that have changed their existing information plans added that these changes were either "planned" (26%; 5/19) or "implemented but not fully developed" (42%; 8/19). The remaining 32% (6/19) reported these changes were operational.

Of those utilities which have made changes in the way information is provided to the media, 38% (6/16) remarked that the new or updated plans have been tested. Utility respondents indicated that 81% (13/16) have made changes which took the form of opening inter-organizational communications lines, 88% (14/16) made changes involving the opening of intra-organizational communication lines, and 69% (11/16) brought in technical experts who have been designated to deal with the news media. Twenty percent noted "other" changes, which included the institution of a media center to handle the large number of media personnel who would descend on a reactor site during an emergency, and plans for local media seminars.

Not surprisingly, 58% (11/19) of the utility representatives felt that the utility should be the primary spokesman at any future nuclear power accident. Five percent (1/19) said that the state government should be the primary spokesman, and 11% (2/19) said this function should be assigned to the Nuclear Regulatory Commission. The remaining 26% (5/19) chose "other."

Seventy percent (14/20) of all the utility respondents have read the full Kemeny Commission Report. Almost all, 89% (17/19), have read the "Public's Right to Information" portions of the Report.

Generally, the utility representatives agreed with the Kemeny Commission's findings on how various groups at Three Mile Island served the public's right to information. Table 4 illustrates how utility respondents reacted to the Kemeny Commission findings.

TABLE 4

	N=12 RM	N=16 Utility	N=12 NRC	N=12 State	N=12 Media
Agree KC	50% (6)	87% (14)	92% (11)	50% (6)	83% (10)
Disagree KC	13% (2)				8% (1)
Uninformed	50% (6)		8% (1)	50% (6)	8% (1)

All of the utility company respondents agreed that the Kemeny Commission's recommendations on improving the "Public's Right to Information" were feasible for their respective organizations to implement.

3. State Government

Forty-three percent (12/28) of the press secretaries for governors of states having commercial nuclear reactors responded to The Media Institute's survey.

Eighty-three percent (10/12) of state government respondents observed that their respective states have made changes in the way they would provide information to the media during a nuclear emergency. Thirty percent (3/10) of those persons who said that their states made changes believed that such changes were in the planning stage, with an equal amount observing that these changes were "implemented, but not fully developed." The remaining 40% (4/10) stated that the changes were "operational." Sixty-seven percent (6/9) noted that their emergency information systems have been tested.

Fifty percent (5/10) of respondents who said changes had been implemented characterized the changes as opening intra-organizational communication lines. Sixty percent (6/10) said inter-organization communications lines had been opened, and 30% (3/10) noted that technical experts had been assigned to deal with the news media. Another 40% (4/10) mentioned that other changes have been made. These included the expansion of existing emergency information staffs, clarification of who will be the primary spokesman in the event of a nuclear accident, and the establishment of news media centers at reactor sites.

Sixty-seven percent (8/12) of the governor's press secretaries believed that the state should be the primary spokesman during a nuclear reactor crisis. Only 8% (1/12) believed the utility should be the primary spokesman. The same number, 8% (1/12), thought the NRC should fill this role. The remaining 17% (2/12) chose the "other" category; 1 of these respondents felt that the utility should be the primary spokesman on-site and the state government off-site, while the other respondent believed a combination of the NRC and state officials would best fill this function.

Forty-two percent (5/12) of the state spokesmen responding have read the full Kemeny Commission Report, while 58% (7/12) have read the portions pertaining to the "Public's Right to Information." Several of the respondents who said they have not read the full Report or the portions of the report on the "Public's Right to Information" observed that there were certainly other officials in the state government who were thoroughly familiar with the Kemeny Commission Report.

State representatives reacted to the Kemeny Commission findings with respect to the various groups as indicated in Table 5 following:

TABLE 5

	N=9 RM	N=10 Utility	N=9 NRC	N=9 State	N=9 Media
Agree KC	22% (2)	30% (3)	44% (4)	56% (5)	56% (5)
Disagree KC	11% (1)	10% (1)	11% (1)		
Uninformed	67% (6)	60% (6)	44% (4)	44% (4)	44% (4)

Sixty-seven percent (6/9) of the state press secretaries responding felt that the Kemeny Commission recommendations were feasible for their offices to implement.

4. Nuclear Regulatory Commission*

Four of the 6 Nuclear Regulatory Commission public affairs offices responded to The Media Institute's survey.

All 4 respondents reported improvements in procedure for information dissemination in the event of a nuclear accident. One respondent noted these improvements were planned; 3 reported changes have been implemented but were not fully developed; and 1 said that the changes were operational.[1] Two respondents added that their updated system has been tested.

All 4 of the NRC respondents indicated that changes have been made, including the opening of inter and intra-communication lines and the designation of technical experts to deal with the news media. One respondent noted that "other" changes have been made, without elaborating on what those changes were.

It is interesting that none of the respondents felt that the NRC should be the primary spokesman at a nuclear accident. One respondent believed the utility should be the primary spokesman. Two of the remaining 3 felt that all 3 groups (utility, state, NRC) should be assigned this role, while 1 individual thought the designation of a primary spokesman should depend on the extent of the accident.

The full Kemeny Commission Report was read by 3 of the 4 respondents -- while all 4 had read the sections of the Report on the "Public's Right to Information."

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*The sample sizes for the Nuclear Regulatory Commission, the Federal Emergency Management Agency and reactor manufacturers was exceedingly small; six, one and five surveys, respectively, were mailed to these groups. For these sections following, raw numbers will be used, as percentages would be misleading.

[1]This sum of responses exceeds the number of respondents, because, as the respondents noted, one change may be planned and another change implemented but not developed.

The Institute's survey found that the NRC offices were in general agreement with the Kemeny Commission findings on the quality of information provided to the public by those groups involved at Three Mile Island, as shown in Table 6 below:

TABLE 6

	N=4 RM	N=4 Utility	N=4 NRC	N=4 State	N=4 Media
Agree KC	2	4	4	4	2
Disagree KC	-	-	-	-	2
Uninformed	2	-	-	-	-

Three of the 4 respondents felt that the NRC could implement the changes recommended for it by the Kemeny Commission.

5. Reactor Manufacturers

Of the surveys sent to the 5 manufacturers of nuclear reactors, 3 responses were received. Two of the 3 reactor manufacturers have made changes in the way they would provide information to the news media. The remaining respondent felt that the existing information system was adequate. One respondent said these changes were operational but had to be tested. As with utilities, this individual said the changes have included the opening of inter- and intra-communications lines and the assignment of technical experts to deal with the news media.

One respondent believed the utility should be the primary spokesman at a time of crisis, another felt the NRC should fill this function, and the third respondent wanted to see the utility as the on-site spokesman and the state as the off-site spokesman.

The full Kemeny Commission Report and the sections on the "Public's Right to Information" were read by all 3 of the reactor manufacturer-respondents. All the reactor manufacturers noted that the Kemeny Commission did not direct any recommendations toward their field on the improvement of public information.

The responses of reactor manufacturers to the findings of the Kemeny Commission on the public's right to information at Three Mile Island are as follows:

TABLE 7

	N=3 RM	N=3 Utility	N=3 NRC	N=3 State	N=3 Media
Agree KC	3	3	3	3	2.5*
Disagree KC					.5
Uninformed					

*One respondent said he agreed with some of the findings, but disagreed with others.

6. Federal Emergency Management Agency

The Federal Emergency Management Agency completed 1 survey. In passing, it should be noted that President Carter has assigned FEMA the task of determining who the "primary spokesperson" should be in the event of a nuclear accident.

The FEMA representative has read the full Kemeny Commission Report and agreed with its findings related to performance of the various groups in question and the recommendations which could be directed to FEMA. Changes for providing information to the news media were planned, but untested. These changes took the form of opening inter- and intra-organizational communications lines. As to a primary spokesman, state government was the tentative preference but it was recognized that the utility, the NRC and FEMA would have the need to make statements and in some cases the duty to do so.

VI. RECOMMENDATIONS OF THE MEDIA INSTITUTE

The complexity of the problems concerning public information during a nuclear power accident cannot be underestimated. It is best that the recommendations of The Media Institute be prefaced by a brief overview illustrating some of the outstanding sources of difficulty such a crisis situation engenders.

The government (state and federal) has a dual responsibility to the public in a radiation-related crisis: it must protect the public from the dangers posed by harmful levels of radiation and from the dangers that accompany general panic. At the same time, the government must respect the public's right to information.

The utilities have a responsibility to alert the public regarding any unusual conditions that may constitute a danger. Such a duty must be carried out conscientiously, to avoid confusion or panic. On the other hand, utilities also have some claim to privacy and to First Amendment rights, as does any business. It is difficult to determine precisely when a problem justifies the curtailment of these rights. In the event of a crisis, yet another conflict arises, for disaster managers from both the government and the utilities: their need to concentrate on vital tasks without distraction must yield, at times, to the public's right to know. Responsible news media carry the burden of alerting the public of impending danger and informing them of events, yet doing so in a way that does not incite undue terror and panic. Likewise, it is incumbent on the news media to report not simply what is transpiring, but also the overall significance of such occurences. Providing perspective is essential for the public to reach informed decisions. Risks, benefits and possibilities have to be addressed, but the treacherous area of "what ifs," that gives rise at times to the very worst, most inflammatory reports, must be tempered by reasonableness and logic.

In sum, the parties involved in the information process during a crisis such as the Three Mile Island accident must function in a context of conflicting demands.

Based on the insights provided by the many survey respondents who generously cooperated, The Media Institute has a number of recommendations that are geared towards improving the information process in nuclear power-related emergencies, so that the public's right to know is well served.

First, it is of the utmost importance that the Kemeny Commission Report reach a far greater audience, particularly, though by no means exclusively, among members of the media. It is essential that these persons gain familiarity with the sections pertaining to the "Public's Right to Information." In view of the high degree of feasibility the recommendations are credited with by the respondents from all groups, these recommendations should be regarded as an overall blueprint for further discussion, examination, improvements and reform.

Second, it is important that the many emergency information plans that are presently at various stages of completion be made fully operational and be tested. There is a tendency, as the initial impetus recedes into the past, for good intentions to flag with dwindling interest. This must not be allowed to occur. All parties should pursue improvements with unfailing vigor, for the importance of advance preparation is one of the Commission's main messages.

Third, seminars on the fundamentals of nuclear power generation should be organized. The widespread interest in such seminars among the media respondents guarantees their success. Utilities, by sponsoring the seminars, could establish improved relations with the media, which would be to their mutual advantage.

Fourth, those media with extremely small news staffs, such as radio stations, should make every effort to establish a working relationship with an expert on nuclear power. Such a consultant could then augment the staff in the event of another nuclear power accident, providing the technical expertise that small news staffs characteristically lack.

Fifth, a primary spokesman, or better still a platform of primary spokesmen, should be designated without delay. For the present, the specific arrangement is of less consequence than that there is some arrangement. The essential point is to avoid the confusion of multiple and conflicting voices which occurred at Three Mile Island. Once a stand-by spokesman has been selected, the innumerable problems should be carefully analyzed, and appropriate refinements instituted.

There are some fundamental problems with the idea of a primary spokesman, however, and these should be addressed. Such an arrangement conflicts with the long tradition of the press checking facts with multiple sources. It has the potential of conflicting with the First Amendment rights of the utility involved. And, if the government is the designated spokesman, there is a further difficulty in that such an arrangement would resemble censorship and might inspire considerable skepticism on the part of the media and the public. A further problem with the reduction of news sources to a single voice might arise if that spokesman were to lose his credibility.

It is only in view of the urgency of the situation and the very real dangers of the alternative (i.e., a repeat of the confusion at Three Mile Island) that The Media Institute recommends that some arrangement be established.

More widespread familiarity with the Kemeny Commission Report among the many relevant groups (the media, the utilities, the state and federal governments), combined with continued and determined efforts at improvement, is the best guarantee that, in the future, the public's right to know will be well served.

the media institute
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February 22, 1980

Two weeks after the Three Mile Island accident, President Carter established the Kemeny Commission charging it, among other things, to make "an assessment of how the public's right to information concerning the events at Three Mile Island was served and [to advise] of the steps which should be taken during similar emergencies to provide the public with accurate, comprehensible, and timely information" (emphasis added). In the latter respect, the Kemeny Commission has directed specific recommendations to the nuclear industry, utilities, the Nuclear Regulatory Commission, state and local governments and the media.

The Media Institute is conducting a nationwide survey of the foregoing groups to determine what action has been taken in response to the Kemeny Commission's recommendations. Would you, or someone on your staff, be so kind as to complete the attached questionnaire and return it in the enclosed envelope?

In appreciation of your prompt response, we will furnish you with a free copy of the survey results.

Thank you in advance for your assistance.

Sincerely,

Leonard J. Theberge
Executive Director

LJT:jt
Attachment

the media institute
1627 K STREET, N.W. • SUITE 201 • WASHINGTON, D.C. 20006 • 202 466-4216

February 22, 1980

KEMENY COMMISSION REPORT QUESTIONNAIRE

Two weeks after the Three Mile Island accident, President Carter established the Kemeny Commission, charging it, among other things, to make "an assessment of how the public's right to information concerning the events at Three Mile Island was served and [to advise] of the steps which should be taken during similar emergencies to provide the public with accurate, comprehensible, and timely information" (emphasis added). In the latter respect, the Kemeny Commission has directed specific recommendations to the nuclear industry, utilities, the Nuclear Regulatory Commission, state and local governments and the media.

The Media Institute is conducting a nationwide survey of the foregoing groups to determine their views on the Kemeny Commission's Report and how they have responded to its recommendations.

The answers to this questionnaire will be combined with those of other participants to show statistical results or patterns. All information provided by you will be kept strictly confidential.

1. Activity in which your organization is engaged (check one):

_____ Reactor Manufacturer
_____ Utility
_____ Nuclear Regulatory Commission (NRC)
_____ State Government or Agency
_____ Other _____
Media:
_____ Newspaper
_____ Newsmagazine
Television Broadcasting:
_____ Network Affiliate
_____ Independent
Radio Broadcasting:
_____ Network Affiliate
_____ Independent
_____ National Broadcasting Network
_____ Wire Service
_____ Other _____

2. Have you read the full Kemeny Commission Report?

_____ Yes
_____ No

3. Have you read the portions of the Kemeny Commission Report pertaining to "The Public's Right to Information"?

_____ Yes
_____ No

4. The Kemeny Commission made findings pertaining to "The Public's Right to Information" with respect to the performance of certain groups during the Three Mile Island accident. Check the item in each column below which most closely represents your opinion about the performance of the following groups:

	Reactor Manufacturer	Utility	NRC	State Gov't	Media
I agree w/Kemeny Commission	____	____	____	____	____
I disagree w/Kemeny Commission	____	____	____	____	____
I am uninformed on Kemeny Commission findings	____	____	____	____	____

5. Do you regard as feasible the Kemeny Commission recommendations pertaining to "The Public's Right to Information" with respect to your organization or activity?

_____ Yes
_____ No
_____ Don't Know

6. MEDIA ONLY RESPOND

The Kemeny Commission recommended that the news media develop an understanding of the basic technology of nuclear power generation.

a) Has your organization designated a person(s) to cover nuclear power issues?

_____ Yes
_____ No

b) Has that person sought to develop an understanding of nuclear power generation?

_____ Yes
_____ No
If yes, how?
_____ Contacted experts:
Who? _____
_____ Attended seminars:
Conducted by? _____
_____ Read articles, essays, books:
Titles?

--THE MEDIA INSTITUTE--

c) Name three persons or organizations you would consult to develop a better understanding of nuclear power.

d) Cite three publications you would rely on to develop a better understanding of nuclear power.

e) If seminars are offered to provide the media with a basic technical understanding of nuclear power generation, would representatives of your organization attend?

_____ Yes
_____ No

f) Name the closest nuclear power plant to your place of employment:

_____

Have you ever visited this or any other nuclear power plant?

_____ Yes
_____ No

FEDERAL & STATE GOVERNMENT, REACTOR MANUFACTURER & UTILITY ONLY RESPOND

The Kemeny Commission recommended that government and industry prepare systematic public information programs to provide the news media with timely, accurate and understandable information during a radiation-related emergency.

a) Has your organization made any changes in the way it would provide information to the news media?

_____ Yes
_____ No

b) At what stage of development are the changes?

_____ Planned
_____ Implemented, but not fully developed
_____ Operational

c) Have you tested this system or plan?

_____ Yes
_____ No

d) What form have the changes taken?

_____ Intra-organization communication lines opened
_____ Inter-organization communication lines opened
_____ Technical experts designated to deal with news media
_____ Other (please elaborate):

e) Would you please enclose any charts, summaries or manuals which outline your plan or system.

f) If no changes have been made in the way your organization provides information to the news media, please explain why:

8. Who do you feel should be the primary spokesperson at any future nuclear power accident?

_____ Utility
_____ State Government
_____ Nuclear Regulatory Commission
_____ Other _____

9. Name of organization _____

Name and Title of person completing _____

10. Please provide any further comments:

The Media Institute is a nonprofit, tax-exempt organization under provisions of the Internal Revenue Code Section 501(c)(3), and as such, contributions by corporations, labor unions, foundations, business and professional associations, and individuals are fully tax deductible.

In its striving to encourage improved reportage of business and economic affairs, The Media Institute performs a number of functions beneficial to journalists, businessmen, academics and others interested in mass communications.

Its analyses of media coverage of selected business and economic subjects contain insights into how an issue was reported over a period of time. The daily monitoring and abstracting of business and economic stories in the semi-monthly, The Television Business-Economic News Index, is the most up-to-date review of television news coverage available.

The quarterly, Business and the Media, and a monthly luncheon speaker series serve as forums for discussion of key issues in the business/media relationship. The releases of the Institute's Economic Communications Center provide the press with instantaneous commentary by noted economists and social scientists on breaking business and economic stories.

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89-459 O - 82 - 7

Mrs. BOUQUARD. Mr. Theberge, I certainly appreciate your testimony. I read it last evening, and again this morning, and it is very valuable, and I look forward to communicating with you further on your recommendations.

We are happy to have with us Congressman Larry Winn, who is the ranking Republican on our full Science and Technology Committee, and while we are waiting on Dr. DuPont at this time I think I might defer to Mr. Winn.

Do you have an opening statement, Mr. Winn? Afterward, we would like to ask questions of you, Mr. Theberge, and Dr. DuPont.

Mr. THEBERGE. Thank you.

Mr. WINN. Thank you, Madam Chairman.

I wish to congratulate you for calling the hearings today on the public awareness of nuclear energy. Although we Members of Congress are often called upon to make policy decisions for our constituents at a fast and furious pace, we must always take the time to assure that the decisions we make are fully understood by our constituents. That is why I believe that these hearings are so important.

This has become of even greater import lately. Sixteen referendums on nuclear power have been scheduled by the various States since 1976. Most recently, the voters of the State of Washington approved an initiative which will give them the right to prior approval of energy construction budgets and bond issues of public power agencies.

A major issue in that referendum was the significant cost overruns experienced by the Washington public power supply system in the construction of their nuclear powerplants. A referendum on the same day before the citizens of Austin, Tex., resulted in that city having to sell its share of a nuclear powerplant now under construction. Both these votes indicate a deep concern by the people on how they are assessed for energy costs, and indicate unanswered questions among the electorate concerning nuclear power.

Therefore, I am delighted that we have taken this time in the subcommittee to examine the role of the public opinion makers of this country and their impact upon the perception of the citizens toward the policies that we establish here regarding nuclear power.

While public opinion policy may fluctuate like waves on an ocean, there can be no doubt that the leaders of the various institutions in our country strongly endorse the continued nuclear power development program. President Reagan has recently issued his statement fully supporting the development of nuclear power for the continued economic growth of the United States.

In his statement he made a series of policy initiatives. One, he directed the Secretary of Energy to give immediate priority to recommending improvements in the nuclear regulatory and licensing process.

Two, he strongly endorsed the demonstration of the breeder reactor technology, including completion of the Clinch River Breeder Reactor.

Three, he lifted the indefinite ban on commercial reprocessing activities in the United States.

Soon thereafter, 32 leading American scientists, including 8 Nobel laureates, strongly endorsed President Reagan's policy initiatives on nuclear energy.

I am sorry that I am late, but I look forward to hearing the testimony today and to participating in the questions and answers, Madam Chairman.

Mrs. BOUQUARD. Thank you very much, Mr. Winn.

Mr. Theberge, how would you compare the media coverage of nuclear energy to coverage of other energy forms or technologies?

Mr. THEBERGE. Again, let us limit our discussion to television where we have really done some indepth studies. For example, we have just finished a study of approximately 40 hours of television evening news coverage of the two oil crises in 1973–74 and 1978–79. There are many similarities to nuclear coverage in terms of the lack of time to sufficiently develop a perspective on the issues, and a much heavier concentration on the peripheral events and personal vignettes.

The difference, of course, is that nuclear energy is a fearful topic, and television depends upon maintaining audience attention by capitalizing on this element of fear. Nuclear energy lends itself to this treatment because it is a more emotive topic than oil.

With the oil question, the emotionalism came in terms of dealing with economic issues like rising gasoline prices, which are quite different than threats to your personal safety and health.

Mrs. BOUQUARD. Thank you very much.

Dr. DuPont, we welcome you to our hearings this morning. You may proceed with your testimony at this time.

Dr. DUPONT. Thank you, Madam Chairman. I apologize for being a few minutes late. You were even more efficient than I thought you would be. Beginning our panel ahead of schedule.

Let me begin by thanking Mr. Theberge and the Media Institute for the opportunity to study the public reactions to nuclear power, and more specifically those reactions reflected in and influenced by television news. I will submit my statement for the record, if I may, Madam Chairman, and summarize it quickly.

Mrs. BOUQUARD. Without objection. We have plenty of time if you want to go ahead.

Mr. Theberge is in no hurry. We are here to hear you.

Dr. DUPONT. All right. Shall I go ahead and read the testimony?

Mrs. BOUQUARD. Very good.

STATEMENT OF DR. ROBERT L. DuPONT

Dr. DUPONT. Madam Chairman and distinguished members of the subcommittee, thank you for your invitation to appear this morning to discuss the impact of the polarized debate on nuclear energy policy. I base my remarks on the study I conducted for the Media Institute on the network television news coverage of nuclear energy, my visits to several nuclear power facilities and their surrounding communities and my direct observations on the nuclear debate in Canada, France, and Britain.

I am submitting, for the record, a copy of the Media Institute study, entitled "Nuclear Phobia—Phobic Thinking About Nuclear Power," and copies of several related articles.

I can summarize my findings simply: Fear has been the dominant issue in the media coverage and in the national debate of nuclear power during the last decade. Taking this one step further, the health dangers associated with nuclear power have not been put into meaningful perspective for the American public.

As a result of this failure, the theme of fear of nuclear power is now dominating the Nation's nuclear debate, to the detriment of our ability to appropriately assess the potential benefits and the costs of nuclear power as a source of electricity.

There are many reasons that the issue of nuclear power has been dominated by fear. The history of nuclear power's association with the atomic bomb looms large in the background.

Additionally, the fact that nuclear technology is unfamiliar to most people makes it more feared—the introduction of new technologies in general has usually led to widespread public fears which have been reduced only to the extent that individuals have direct contact with the new technology. The isolation of nuclear powerplants has helped prevent the exposure which could have reduced the fear.

In addition, radiation can be neither seen, heard, touched, smelled nor tasted. This adds to the fearful mystery. The fact that cancer, along with birth defects, can be a long-delayed and unpredictable result of radiation exposure further compounds the problem.

Finally, and even more relevantly, the widespread distrust of major institutions which has characterized our society over the last two decades has undermined the ability of these institutions to provide education about this technology, including a realistic appraisal of its risks.

With respect to steps which can be taken to reduce the fears of nuclear power, I have three specific suggestions.

One, the public, particularly those living near nuclear plants, needs to have more direct, personal exposure to the nuclear powerplants and to the ability to measure personal radiation exposure. Contact with people who work with radiation, especially those who work in nuclear powerplants, can also help reduce fear.

Two, local, State, national and international institutions need to educate themselves and to communicate directly and relevantly with the public about the costs and benefits of nuclear power and the available alternative sources of energy. This effort should include assessment of the actual and potential health risks of alternate energy sources and the relationship of these risks to other more familiar health risks to which the public is exposed. The Department of Energy and the national media should be among the first to do this.

Three, the fear component of the nuclear debate should be clearly defined as a health problem in its own right and direct steps should be made to reduce it. One principle stands out from all others in the treatment of fear reactions: the person who is fearful needs help in defining and overcoming the problem by confronting his or her fear.

Avoidance of the fearful stimulus is likely to promote and prolong the fear. Face the fear and the fear disappears.

Some will argue that nuclear power is dangerous and that the fear reactions in the public are not inappropriate or excessive. While I am not in a position to argue about what might be or what could be, the public is entitled to clear statements about what is.

That includes statements about the current levels of radiation exposure of the average American and the sources and health consequences of this exposure. This is not now available to most people.

Three factors are preeminent in the public's willingness to endure health risks. The first is familiarity. The familiar is acceptable even if the health risk is high, while the novel risk, even if it is low, is often feared.

Second, risks that one controls, or feels one controls, are more tolerable than risks controlled or perceived to be controlled by others.

Third, risks manifest by single large results are feared excessively, while risks spread over time and space tend to be minimized.

Thus, the remarkable paradoxes that the single greatest cause of preventable illness in the United States and in the world, including the leading preventable cause of cancer, is not radiation, but cigarette smoke.

This health hazard creates no news, no pickets, and almost no controversy. Cigarettes are familiar, the user has what is often the illusion that he chooses to smoke. In addition, the 350,000 deaths caused each year by smoking are dispersed over time and space.

The same three irrational psychological factors governing risk assessment by the public work to maximize the fear of nuclear power and to minimize the fear of cigarette smoking, and of non-fear producing energy sources.

With respect to the specific topic of these hearings, the impact of the polarized debate on nuclear energy, it is clear that this polarization perpetuates the fear of nuclear energy in at least two ways.

First, it gives meaning and legitimacy to the fears. The fears are encouraged directly by some opponents of nuclear power.

Second, the debate, and the media's approach to fear of nuclear power as a controversial subject insures that the public hears contrasting opinions. Those who argue that fear of commercial nuclear powerplants is irrational are balanced by those who argue that it is reasonable.

This process tends to undermine sources of reassurance and to exaggerate mistrust of the scientifically sophisticated individuals and institutions who are more reassuring.

While the debate about energy is to be encouraged, the debate about health safety is, I believe, largely counterproductive. Opponents to nuclear power do appropriately argue that nuclear power could be a health danger. This is true. They should, however, also emphasize that as these plants have actually operated over the last 25 years, they have produced no radiation-related injury to any member of the public.

This is true even of the tragic accident at the Three Mile Island nuclear powerplant. This "what if" fact should be repeatedly emphasized.

I am not an expert on nuclear energy; I am, however, an expert on fear. I am convinced that until we find effective ways to reduce

public fear of nuclear power, our nuclear debate will be frustrating and inconclusive. I hope that your hearings today will help move us toward consideration of nuclear power free from irrational and inappropriate fear. Then nuclear power can be judged, as it should be, on economic, health, and technological grounds. Only in this way will the public interest truly be served.

[The prepared statement of Dr. DuPont plus submissions follow:]

STATEMENT OF ROBERT L. DUPONT, M. D.
BEFORE THE COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON ENERGY RESEARCH AND PRODUCTION,
U. S. HOUSE OF REPRESENTATIVES, WASHINGTON, D. C.
December 15, 1981

Madame Chairman and distinguished members of the Subcommittee, thank you for your invitation to appear this morning to discuss the impact of the polarized debate on nuclear energy policy. I base my remarks on the study I conducted for the Media Institute on the network television news coverage of nuclear energy, my visits to several nuclear power facilities and their surrounding communities and my observations on the nuclear debate in Canada, France, and Britain. I am submitting, for the record, a copy of the Media Institute Study, entitled "Nuclear Phobia - Phobic Thinking About Nuclear Power," and copies of related articles.

I can summarize my findings simply: Fear has been the dominant issue in the media coverage and in the national debate of nuclear power during the last decade. Taking this one step further, the health dangers associated with nuclear power have not been put into meaningful perspective for the American public. As a result of this failure, the theme of fear of nuclear power is now dominating the nation's nuclear debate, to the detriment of our ability to appropriately assess the potential benefits and the cost of nuclear power as a source of electricity.

There are many reasons that the issue of nuclear power has been dominated by fear. The history of nuclear power's association with the atomic bomb looms large in the background. Additionally, the fact that nuclear technology is unfamiliar to most people makes it more feared -- the introduction of new technologies in general has usually led to widespread public fears which have been reduced only to the extent that individuals have direct contact with the new technology. The isolation of nuclear power plants has helped prevent the exposure which could have reduced the fear. In addition, radiation can be neither seen, heard, touched, smelled nor tasted. This adds to the fearful mystery. The fact that cancer, along with birth defects, can be a long-delayed and unpredictable result of radiation exposure further compounds the problem. Finally, and even more relevantly, the widespread distrust of our major institutions which has characterized our society over the last two decades has undermined the ability of these institutions to provide education about this technology, including a realistic appraisal of its risks.

With respect to steps which can be taken to reduce the fears of nuclear power, I have three specific suggestions:

1) The public, particularly those living near nuclear plants, needs to have more direct, personal exposure to the nuclear power plants and to the ability to measure personal radiation exposure. Contact with people who work with radiation, especially those who work in nuclear power plants, can also help reduce fear.

2) Local, state, national and international institutions need to educate themselves and to communicate directly and

relevantly with the public about the costs and benefits of nuclear power and the available alternative sources of energy. This effort should include assessment of the actual and potential health risks of alternate energy sources and the relationship of these risks to other more familiar health risks to which the public is exposed. The Department of Energy and the national media should be among the first to do this.

3) The fear component of the nuclear debate should be clearly defined as a health problem in its own right and direct steps should be made to reduce it. One principle stands out from all others in the treatment of fear reactions: the person who is fearful needs help in defining and overcoming the problem by confronting his or her fear. Avoidance of the fearful stimulus is likely to promote and prolong the fear. Face the fear and the fear disappears.

Some will argue that nuclear power IS DANGEROUS and that the fear reactions in the public are not inappropriate or excessive. While I am not in a position to argue about what "might be" or what "could be," the public is entitled to clear statements about what IS. That includes statements about the current levels of radiation exposure of the average American and the sources and health consequences of this exposure. This is not now available to most people.

Three factors are preeminent in the public's willingness to endure health risks. The first is familiarity. The familiar is acceptable even if the health risk is high, while the novel risk, even if it is low, is feared. Second, risks that one controls, or feels one controls, are more tolerable than risks controlled, or perceived to be controlled, by others. Third, risks manifest by single large results are feared excessively, while risks spread over time and space tend to be minimized. Thus, the remarkable paradoxes that the single greatest cause of preventable illness in the United States and in the world (including the leading preventable cause of cancer) is not radiation, but cigarette smoke. This health hazard creates no news, no pickets, and almost no controversy. Cigarettes are familiar, the user has what is often the illusion that he "chooses" to smoke, and the 350,000 deaths caused each year by smoking are dispersed over time and space.

The same three irrational psychological factors governing risk assessment by the public work to maximize the fear of nuclear power and to minimize the fear of cigarette smoking (and of non-fear producing energy sources). With respect to the specific topic of these hearings -- the impact of the polarized debate on nuclear energy -- it is clear that this polarization perpetuates the fear of nuclear energy in at least two ways. First, it gives meaning and legitimacy to the fears. The fears are encouraged directly by the opponents of nuclear power. Second, the debate, and the media's approach to fear of nuclear power as a "controversial subject," insures that the public hears contrasting opinions. Those who argue that fear of commercial nuclear power plants is irrational are balanced by those who argue that it is reasonable. This process tends to undermine sources of reassurance and to exaggerate mistrust of the scientifically sophisticated individuals and institutions who are more reassuring. While the debate about energy is to be encouraged, the

debate about health safety is, I believe, largely counter productive. Opponents to nuclear power do appropriately argue that nuclear power could be a health danger. This is true. They should, however, also emphasize that as these plants have actually operated over the last 25 years, they have produced no radiation-related injury to any member of the public. This is true even of the tragic accident at the Three Mile Island nuclear power plant. This "What Is" fact should be repeatedly emphasized.

I am not an expert on nuclear energy; I am, however, an expert on fear. I am convinced that until we find effective ways to reduce public fear of nuclear power, our nuclear debate will be frustrating and inconclusive. I hope that your hearings today will help move us toward consideration of nuclear power free from irrational and inappropriate fear. Then, nuclear power can be judged, as it should be, on economic, health, and technological grounds. Only in this way will the public interest truly be served.

Nuclear Phobia—
Phobic Thinking About
Nuclear Power

A Discussion with Robert L. DuPont, M.D.

by

the media institute

March 1980

Nuclear Phobia—Phobia Thinking About Nuclear Power

ROBERT L. DuPONT is a practicing psychiatrist and president of the non-profit Institute for Behavior and Health, Inc. He is a diplomat of the American Board of Psychiatry and Neurology, a fellow of the American Psychiatric Association, and a member of many professional organizations, including the Academy of Behavior Medicine Research, the Behavioral Medicine Special Interest Group, the American Public Health Association, and the District of Columbia Medical Society. He is also chairman of the Drug Dependence Section of the World Psychiatric Association, a position he has held since 1974. He holds the faculty positions of Associate Clinical Professor Psychiatry and Behavioral Sciences at the George Washington University School of Medicine and Visiting Associate Clinical Professor Psychiatry at Harvard Medical School.

Dr. DuPont is a graduate of Emory University, and received his M.D. from Harvard Medical School. He was a medical intern at Cleveland Metropolitan General Hospital, Western Reserve Medical School; psychiatric resident and teaching fellow, Massachusetts Mental Health Center, Harvard Medical School; and Clinical Associate, National Institute of Health.

In May, 1978, Dr. DuPont chaired a Special Session at the American Psychiatric Association's (APA) Annual Meeting in Atlanta on the "Treatment of Phobias." He chaired a similar Special Session at the 1979 APA meeting in Chicago. In 1980 he will lead the second National Phobia Conference which will be held in Washington, D.C. and he will chair a special educational program on phobias at the annual meeting of the American Psychiatric Association.

He has authored more than 100 professional articles and a book on topics in the field of health promotion, drug abuse prevention, and criminal justice. In addition, he appears on ABC-TV's "Good Morning America" program and has contributed to local and national TV, radio, magazines, and newspapers on a variety of health topics.

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Introduction

Atomic power inspires awe and wonder. It also inspires fear, both healthy and unhealthy, and it was this aspect of the atom's impact on the peoples of the world which an international group under the auspices of the World Health Organization (WHO) met to discuss in Geneva, Switzerland, in October 1957.

The Study Group on Mental Health Aspects of the Peaceful Uses of Atomic Energy observed in its report:

"There is indeed evidence that it is exceedingly difficult for many people to keep the productive uses of atomic energy clearly separated in their minds from its destructive possibilities and that this inability contributes to making the whole concept of atomic energy potentially a frightening one. (WHO Technical Report Series No. 151. p.5)

"Moreover," the report went on, "as atomic energy is so gigantic a force emanating from exceedingly small quantities of matter, and cannot be seen, heard, smelt, tasted, or felt, it easily provokes irrational phantasies . . . ." *(Ibid.)*

Twenty-three years later, the report is as pertinent as when it was issued. Many people still have difficulty separating in their minds the productive and destructive potentials of atomic power. And it still "easily provokes irrational phantasies." Moreover, there is considerable evidence that television may have contributed to those phantasies. Much of the evidence supporting this position is contained in a study by The Media Institute of television news treatment of atomic energy in the years 1968-1979. (The Media Institute. Television Evening News Covers Nuclear Energy: A Ten Year Perspective. Washington, D.C.: 1979).

Among the experts in various fields who analyzed the aggregate of 13 hours of videotaped news broadcasts compiled for The Media Institute's study was a nationally-known practicing psychiatrist with wide personal experience in both print and broadcast media, Dr. Robert L. DuPont.

Dr. DuPont's scrutiny of the tapes led him to observe that the major television networks have injected, intentionally or otherwise, further fear—irrational, phobic fear—into an already fear-inspiring subject: nuclear energy. In a question-and-answer discussion with The Media Institute, Dr. DuPont explained why atomic energy tends to rouse phobic fears and how television has abetted this tendency. He also discusses practical means of counteracting "nuclear phobia."

To put Dr. DuPont's remarks into perspective, The Media Institute has included in an appendix several passages from *Mental Health Aspects of the Peaceful Uses of Atomic Energy*, World Health Organization, 1957.

Nuclear Phobia— Phobic Thinking About Nuclear Power

A Discussion with Robert L. DuPont, M.D.

Q.* *Having seen 13 hours of videotapes of nuclear energy news coverage on television, what is the dominant impression you received?*****

A. Fear was the motif of the entire series of nuclear stories. The driving force in the nuclear energy issue is fear. It is not economics, it is not energy production, it is fear. There is no question in looking at these tapes that the public debate is primarily going to hinge, not on the technology, not on the economics, not on the alternate energy sources, but on the fear. Right now the tide appears on the tapes to be running with those who are encouraging the fear. In fact, I would say it this way: those who are reassuring about nuclear energy are themselves being consumed by the dynamics of our public fear of nuclear energy.

Q. *Please elaborate.*

A. Voices of reassurance are constantly being undermined by the fear process itself. They are undermined as being self-interested, as being a part of the nuclear energy industry. Ralph Nader said essentially that nuclear power is the nation's technological Viet Nam and that the government and experts have a vested interest in promoting nuclear energy. What this implies is that almost anybody who knows anything about nuclear energy has an investment in

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*Note: ***Q.***—*The question asked by The Media Institute*
A.—Dr. DuPont's response

**The tapes viewed by Dr. DuPont are a compilation of all news stories regarding nuclear power generation broadcast by ABC, CBS and NBC on their evening news programs between August 5, 1968 and April 20, 1979.

it, and therefore cannot be believed, unless, of course, he is in that minority who are saying nuclear power is as bad as you think, or worse. Only then is the expert credible. It is amazing.

The paradox that a person like myself, or anyone connected with the media, has to deal with is that often real social progress is a result of fear reactions. But progress never comes without paying a price. The new regulations that are going to come from that airplane crash in Chicago are going to be paid for by all of us in higher air fares. They may or may not reduce the risk of flying. The same thing is now happening with nuclear energy. The cost of diminishing the hazards may make nuclear power uneconomical. But economics are not the driving power behind the nuclear power debate. The debate is hinged on fear of a particular kind. I would call it *nuclear phobia,* or more precisely, phobic thinking about nuclear power.

Q. What is a phobia?

A. A phobia is fear based on an exaggerated, unrealistic danger. For example, if you are afraid when a lion bounds out of a cage at the zoo and comes toward you, that is normal, healthy fear: the danger you face is external and substantial. If, on the other hand, you are afraid to go into the zoo at any time because the sight of a snake—even in a cage—strikes terror into your heart, that is a phobia. Phobic people are generally mentally healthy people who have been sensitized to particular experiences or situations which trigger terror or panic reactions.

Phobic reactions are usually not an exaggeration from zero risk. Often there is some risk in phobic situations. For example, people who have an elevator phobia will tell you: "The elevator *could* get stuck." It's true—an elevator *could* get stuck. And a person who has a fear of flying knows an airplane *could* crash. Many people suffer from hypochondria, a related condition. A hypochondriac will ask: "Could I have cancer?" The physician will have to say, "Yes, you could. My best judgment is that you don't. I have looked you over and haven't found cancer, but it could be there." Phobic fear is out of proportion to the real, external

danger. Airplanes do crash, and elevators do get stuck, and lions do escape from their cages at the zoo. But in all these situations we normally act as if the risk of these problems does not exist, since the risk is so low. The phobic person, however, despite reassurance to the contrary, experiences these situations as if the risk of danger were very high. His individual phobic response is involuntary, and, in most cases, outside the phobic situation he thinks clearly and realistically. In addition many, but not all, phobics fear that they will lose control of themselves—that they may leap from a height, make fools of themselves in a supermarket, or pass out. Thus for most phobias there is an inner dimension—fear of loss of control—as well as an external dimension—fear of the airplane.

Q. *Do you feel the coverage of nuclear energy on the videotapes you studied encouraged phobias in the viewers?*

A. A phobia is a malignant disease of *what ifs*. The phobic thinking process is a spiraling chain reaction, to use an atomic energy analogy, of *what ifs*, and each *what if* leads to another. "What if this happens and then what if that happens, and then what if the other thing happens?" Phobic thinking always travels down the worst possible branchings of each of the *what ifs* until the person is absolutely overwhelmed with the potentials for disaster. Often these worst case eventualities remain only partly articulated even to the phobic himself. Feelings of dread mix with half-formed thoughts of disaster to produce a phobic spiraling of terror. When I reviewed The Media Institute's network news nuclear energy tapes, one of the striking characteristics I saw occur over and over was the reporters continually going down those *what if,* worst case branches. That is exactly what happens with phobic people. The problem becomes the *what if* rather than the *what is*.

Most of the "nuclear disasters" I saw described on the television tapes were *what ifs*. Consider for a moment *The China Syndrome*—a Hollywood film about an accident at a commercial nuclear power reactor that predated and presaged Three Mile Island. I talked about it with a person who saw the film. She was terrified. I asked what *really* hap-

pened in *The China Syndrome*? The answer was, "Nothing—but it almost did—there was almost a disaster." You ask the same question about Three Mile Island and other nuclear incidents. The actual feared thing itself did not happen, yet the frightened person will come back and say, "But it almost did." That is characteristic of phobic thinking. The fear is not of what *did* happen but of what *almost happened*. The "it" in this statement itself is a phobic distortion—a condensation into a single pregnant pronoun of myriad potential negative scenarios ranging from trivial leakage of small amounts of radiation to nuclear explosion. In phobic thinking, the event as it actually occurred is rarely feared. The *what if*s are feared. Phobic fear, at root, is fear of fear; fear of the panicky feeling.

Q. *Does everyone who opposes nuclear power have a phobia?*

A. No! I am not even saying that opposition to nuclear power is wrong—or, for that matter, that support of nuclear power is right. In our Phobia Treatment Program we have not seen a single person seeking treatment because of "nuclear phobia." Nevertheless, after viewing the 13 hours of network TV news tapes, I am convinced that fear is the dominant theme of this particular TV coverage and that much of the fear of nuclear power has elements of phobic thinking.

Q. *Wouldn't people unable to distinguish real from unreal dangers tend to be less intelligent than the average?*

A. Two points must be made here. Phobic people are generally intelligent people. In fact, the ability to anticipate problems before they occur is the hallmark of intelligence. Thus it would be foolish to deny all possible problems. The difference between reasonable anticipatory anxiety and phobic thinking is clear at the extremes but blurred at the boundary. Fear of getting on an ordinary elevator is irrational and unreasonable. Fear of motorcycle racing is not so obviously phobic, even if you have never had an accident! Thus the second point—the definition of what is reasonable

—is, in some cases, a matter of judgment. Not everyone will agree with my point of view about every situation. My observation, however, is that fear based on *what if* rather than *what is,* especially when this fear involves a spiraling, poorly articulated chain-reaction of potential disasters, is likely to be phobic fear.

Q. *To accept nuclear energy, then, is like accepting the airplane as a means of transportation: not 100% foolproof but generally safe?*

A. Yes. The airplane is a wonderful example because you as passenger do not have control. To fly you must put yourself in the hands of the Federal Aviation Administration (FAA), the airline maintenance people, the pilots, the Weather Bureau—all these faceless, unknown people. Essentially you have to give to authorities, people who are charged with the responsibility of caring for you, the responsibility of your life. And you say, "Okay," when you step on that plane. You no longer have the capacity to influence your own safety once that door shuts.

That sounds like a scary thing to do. But for most of us who fly, it is with a sense that there are few things we do in life where there are so many checks for safety as there are in insuring the safety of a commercial airplane. That does not mean that flying is absolutely safe.

In order to lead a normal life, we all must have a certain amount of trust, to deal with our own *what if*s. Today, in nuclear energy, this needed trust is eroded. We are left with our own hazy, half-formed, *what if*s about nuclear energy. "Can you be absolutely certain there won't be a melt down?" "Can you be absolutely certain there won't be an accident?" "Can you be absolutely certain that whatever . . . won't happen?"

You cannot be certain, no one can. The media pushes microphones in the faces of the experts and says, "But can you be *certain*?" The honest expert will say "No." So it is reported that the head of the Nuclear Regulatory Commission, or whoever the expert is, admits that a nuclear accident could happen. So what else is new in life? Of course an accident could happen! It is a question of balancing that

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risk versus the alternative risks and assessing the costs. That perspective was almost never brought out on these tapes; *there is almost no mention of risk balancing*. And the nuclear power industry itself contributes to this feeling of all or nothing.

Q. How?

A. Industry people say, for example, in trying to prove how safe nuclear plants are, that there has never been a death in a nuclear power plant. That is too much, of course, because there *could* be. The fact that there has not been one is a substantial achievement, but there could be an accident and people ought to know about that. The best statement I heard on this point was by a scientist who talked about a study in Washington state which reported that of 4,000 deaths from all causes over many years of persons who worked at a nuclear facility, one scientist estimated that there were 30 to 50 "extra" cases of cancer which may have been due to something—probably radiation—at the nuclear plant.

The reporters who covered the story asked questions and used a tone of voice which carried the message: "Well, God, isn't that terrible?" The scientist said, "No, this is a risk that comes from that activity. People ought to know the facts, but you sure shouldn't close down the plant because of that additional risk." While this particular study may be disputed and even ultimately incorrect in exaggerating the danger to workers at nuclear plants, this is not my point. This kind of straight forward information—including negative potentials—is what people need about nuclear power and alternative power sources. We are not getting this perspective now. I saw no perspective in these TV tapes about the risks of alternative forms of electrical power generation—risks for the workers in the plants or for the public.

I am reminded of a friend of mine who was outraged about nuclear waste disposal and the hazards it might produce in some future time. While she was expressing her anger, she smoked a cigarette. On the one hand, she was worried about a hypothetical danger that sometime in the

next 250,000 years there might be seepage from nuclear waste, on the other hand, she had an absolutely certain health danger burning between her lips. The difference was that she was familiar with the one, she was not familiar with the other. One risk she denied, the other she magnified.

Q. Is nuclear energy particularly conducive to phobic fears?

A. Nothing else is so apt to produce phobic fear. First of all, nuclear energy is still so alien, so strange. It is not like elevators, or fire, or lions. Some of its dangers are invisible, and there is also a long, uncertain delay between exposure and resulting health problems.

People also fear a nuclear explosion. The atomic bomb is fixed in our collective consciousness as an ultimate and terrible explosion that killed tens of thousands of people. Experts say that nuclear reactors cannot explode in the sense of an atomic bomb explosion. But people still think of the image of the bomb. In an era of mistrust of all experts, especially nuclear experts, who can be sure a nuclear plant won't explode like an atomic bomb? There is also the threat of radioactivity. Another unique aspect of the nuclear threat is the long term nature of the risk. You know you might survive a blast. But as one of the workers said on the tapes: "What if I get skin cancer in 15 years? Who is going to take care of me then?"

Nuclear fear is the playing out of the *what if*s in our age. It is not like getting off the airplane and feeling, "Whew, I made it off the plane!" The risk of radioactivity is more like getting off the airplane and feeling that 15 years later you *might* die from that plane trip! You cannot tell for sure.

A person I know has a family history of a disease called Huntington's Chorea. It is a deadly, inherited neurological condition. It shows up only in middle life, in the 30's and early 40's. There is no way to predict it. Half of the children of the people who have this condition will inherit it. You never know who it will strike, so all the children have to live their entire early adult lives, marrying and having children, or rejecting these options, never knowing. They don't know whether or not they have this condition and never know whether or not they have passed it to their own children un-

til they are middle aged. Every time they have an abnormal muscle movement, they wonder if it is the first sign of the disease. It is devastating to have to deal with that kind of mysterious, terrible threat. It could be there. That is the thing that happens with the nuclear radiation, the unknown nature of the risks over many years nourishes the fears in a way that is unique to nuclear fear.

Each new technology has produced fear. Electricity and natural gas are examples as are the train, the automobile and the airplane. None of these technologies was or is absolutely safe. We should continue to make them safer. But none of these now familiar technologies produce widespread fear today.

Q. Will nuclear energy in time also become a familiar technology and thus less fear-inspiring?

A. Nuclear energy is unique in terms of the public perception that only brainy people can understand it. Nuclear power, from the early experiments of the Curies to the Bomb to the nuclear power plant down the road has been experienced as the scary and potentially evil genie which ordinary people cannot understand.

Nuclear power is controlled by powerful, remote establishment organizations—the government, the energy companies, etc. Many who fear the influences of these powerful people and institutions also fear nuclear power for these reasons. Nuclear power uniquely taps anti-military feelings because of the connections in many peoples' minds of nuclear power and the atomic bomb. Then there also is a much more primitive concern: it has to do with living and dying, and with one's offspring. Again it is the issue of an uncertain and therefore more terrifying risk.

What the public has never done, and what the public desperately needs to do, is to be able to put these risks of nuclear power into an understandable, familiar context so that they can relate to them. Take the genetic issue. The presumption from seeing these TV news tapes is that in the absence of exposure to radioactivity, one is not going to have genetic problems. On the other hand, if you are exposed, there will be genetic changes.

In the first place, it is important to realize that genetic changes—or mutations—are part of normal biological life. Man's evolution is the result of genetic mutation, and presumably this is a continuing process. We know that mutations can lead to better health and adaptative responses, just as they can produce genetic disasters, though negative mutations are far more common. Certainly, with increases in radiation levels there is an increased risk of mutation, and most of these will be negative. Notice, this is an increased risk, not a certainty, of genetic mutation. It is the same with cancer. The presumption on the tapes is that you either will not have cancer if you do not get radiation exposure, or you will get it if you do. That is incorrect. The truth is that you have an increased risk of cancer with increased radiation exposure.

Finally, the tapes suggest that nuclear power is a primary source of contemporary radiation exposure. This also is incorrect—radiation exposure is part of our environment, both natural and man-made. The additional risk of radiation from nuclear power needs to be seen in perspective. It is unrealistic to even think of achieving a zero radiation exposure. This goal destroys rational discussion.

Q. *How does television as a medium transmit phobic thinking?*

A. There are two parts to the transmission process. You see people in various roles on camera who are afraid. Then you are told by some experts who are critical of nuclear power, authority figures, that *they* are afraid. Think about that. That was what was so significant, for example, about Howard K. Smith's comments about nuclear power—his bottom line, his last comment after Three Mile Island: "I fear it." He gave the same arguments he had once given in favor of nuclear power, but this time there was a twist at the end. He said, "I fear it." And now he implied, because he had fear, he did not support nuclear power. And that is the key. You see authority figures who say "I fear it." That is what the child understands when he sees his mother afraid of a thunderstorm. This authority figure, this window on the world, says the right way to behave is to be afraid.

The other thing that regularly happens is that television contributes to undermining our national trust in authority. The people who are saying it's okay to get on the airplane, it's okay to take this risk, are called into question. The industry spokesmen that are interviewed appear as fat cats, special interest groups and scary, brainy types. They are stereotypes, targets to put down, and they are balanced by "consumer interests" or "concerned scientists." In these tapes, the critics seem to have the high ground in terms of being the ones who are saying, "You are right to be afraid!" The presumption is that they are less self-interested.

I think there is a big question about that issue; about whether they are less self-interested. The issue has to do with the payoff they get from the media attention itself. Their payoff is, at least, two-fold. One is they get a tremendous boost to their ego in feeling they are doing something noble, and God knows we all like that. But second, they get attention paid to them. It is educational to see the extent to which the anti-nuclear protesters, and the groups that are formed around this issue, are dependent on media attention, and hungry for it. The media response is eerie. The presumption in the media often, but not always, seems to be that the protesters and the other "anti's" are free from the taint of self-interest, in contrast to the experts.

***Q.** Did the fear transmitted by the tapes tend to concentrate on certain aspects of nuclear energy?*

A. There were three main areas of concern about nuclear power expressed over the decade in these tapes. One was the disposal of the waste, and the standard that seemed to be applied was, "Can you assure us that, during the next 250,000 years, there will be no leakage or problem from this waste?" Of course, the answer was "No." "Then it is unacceptable," was the implied conclusion.

The second concern was about terrorism. "Can you be certain that there could be no terrorist assault that would either sabotage the nuclear power plant and cause a nuclear disaster or lead to theft of radioactive material?" The answer again had to be "No." You cannot say absolutely that every facility is secured at all times from any con-

ceivable attack. There have to be circumstances when some plants are not totally secure.

The third question was, "Can you be sure that there will not be an accident that will lead to contamination of the environment, whether it is a melt down or just a venting of radioactive water or steam?" Again the answer was "No"; experts cannot be completely reassuring. Those three dangers came up over and over again. And the inability to say *absolutely* there is no danger was seen as an admission that nuclear technology is faulty.

The critics of nuclear power seemed to have the high ground on the tapes. There have been and continue to be accidents—unexpected occurrences of some danger. Following each accident an investigation shows mechanical, design, and/or human failures. Even if the accident produces no injuries and even if the rate and seriousness of accidents is less than in comparable technologies, the occurrence of the accident itself is seen as justification for the critics. Finally, even in the absence of an accident, the critics appear "right" because no one can say an accident could not occur!

Q. Why is this kind of thinking so prevalent?

A. What is missing is a sense of perspective. We do not ask that stewardesses and pilots who are exposed daily to cosmic energy radiation be taken out of airplanes. Yet they are exposed to too much radiation over time according to some standards. Medical radiation from x-rays is another more famililar risk. That perspective is almost totally missing from these tapes. In fact, whenever anybody tried to bring up something like that, it seemed his credibility was undermined.

Q. Why?

A. Because of the *what ifs*. I know this from my own work with phobics. What if somebody that I have helped drive a car or return to air travel is involved in a serious or even a fatal accident? People want to avoid being in a responsible position for any bad event. Medical people are very fearful

of being in that position. In addition, we must be realistic: there is also a history of radiation standards that were acceptable to the authorities in previous decades or generations, which are no longer acceptable. The standards have been raised, and this change in standards tends to undermine the public's trust in the judgment of the authorities today.

***Q.** How did most of the media people in the tapes behave during the Three Mile Island coverage?*

A. Most reporters kept a pretty good distance from the issue. I did not see many who seemed to understand it, or who were involved directly. Their detachment was appropriate. Some, however, looked fearful during the Three Mile Island crisis. Walter Cronkite on CBS looked harried, confused. On the Friday night broadcast on ABC, both Bettina Gregory and Max Robinson looked frightened. Part of that apparent fear may have been their inability to figure out exactly what the story was. I would think, in retrospect, that they would have to worry about what that story really was because they would have to know, at some level, that it was a story about *what if,* or what might have been. That is not common in journalism. You just do not see a lot of stories of planes that might have crashed.

All this raises the fascinating question of, "What are we interested in?" And you might ask the question, "What makes the news?" Why is this news? The answer is: *Fear is news because fear is interesting.* One of the characteristics of the fear reaction is a heightened sensitivity to what is around a person and a heightened sense of what might happen.

***Q.** What is the psychological reason for our interest in fear?*

A. The adrenalin gets flowing, our minds become more alert. It is like taking amphetamines. Fear is an upper. You are ready for action! This upper effect works for the media. Fear is news.

***Q.** Does the media deliberately make use of fear to get our interest?*

A. The longest lines at amusement parks are always for the scariest rides. People will pay for thrills. Think about the race driver. The reason you and I don't drive our cars fast around corners, and spinout and so forth, is not because we do not like that feeling, but because it is imprudent. The feeling itself is exciting. Then too, frightening stories capture our attention. There is no question but that one gets attention with fear; there is nothing to parallel it. The media is drawn into that, it has to be, simply on the basis of the biology.

Most people in the media probably have not thought much about what the factors are that push them into those positions. But I think that many are aware that what gets people's attention is often fear. If you reassure people and say there is no problem, that's like saying, "There is no news. I don't have anything to say." But if you say, "There is a problem, there is danger," you're going to get people's attention. On an intuitive level every reporter and editor realize this. It is less common, and less comfortable, to think of the negative side of this process.

Media people must worry that they are going to say something is okay, and then the *what if* disaster is going to happen. The bad thing, the feared *what if,* from time to time, will happen, and nobody wants to be in the position of having said the danger is exaggerated only and have disaster strike. Even if 99 times out of 100 the reassurance proves to have been correct, that one time reassurance is followed by disaster will hurt, and the hurt will last for longer than the effect of the other 99 times. Remember, the pessimist is never disappointed. "After all," he can always say, "disaster almost did happen!"

Q. *That in itself seems to be a phobic train of thought.*

A. That's right. It is hard for media people, who feel themselves in a position of responsibility, to tell people that a threat may be exaggerated.

Q. *Why don't they play that reassuring role more often?*

A. Becuase there is interest in disaster, and because the

reporters are worried that if the worst case should come up and they don't signal it in advance, they haven't given the facts to the people. They would be found guilty of minimizing a potential problem, a *what if*. They would be "in bed" with the "authorities," and they do not want to be found guilty of that. So they have got to talk about the risks and be cautious of reassurance. For example, at Three Mile Island the bottom line in the media coverage was not that no one was hurt. The bottom line was: we narrowly averted a nuclear holocaust, a nuclear catastrophe, the ultimate. As Walter Cronkite said, "The world has never known a day quite like today. It faced...the worst nuclear power plant accident of the atomic age." This is the bottom line of the public's awareness. The Three Mile Island experience is going to be a dominant image, probably for the next decade, because it has been burned into the collective consciousness, largely through television news.

Q. *The phrase is heard throughout the tapes, "They are in bed with" so and so. What does that mean?*

A. It goes to the heart of one of the best and worst qualities in this country. Right from its beginning, we have had an anti-authoritarian bias. We have had the shared conviction that people in charge whether George III, or the President, or Chairman of the Board of General Motors, the big guys up there, are feathering their own nests at our expense. This appraisal has often proved both correct and helpful. The problem with it is that anybody who has any expertise or any authority gets defined as being antithetical to your and my personal interest. The most curious aspect of this process is the "they." It is often used in these tapes. "They" say this, or "they" say that. The "they" referred to usually have to do with authority figures. And the presumption is that they are not people; that they do not want to do right; they want to poison kids, destroy communities, blow up factories. "They" are also conspiring together, "in bed," against "us," or so it seems to be implied.

Q. *Do people feel "they" have been romanced by authority and corrupted with money?*

A. "They"—the experts—have been tainted by their power and their knowledge. It is magical thinking. "They," by their expertise, have become alien from you and me. It is now hard to view the nuclear issue, and in fact, all of energy is increasingly like this, without this attitude. It is hard for the average person to relate to the technical issues in nuclear power. "They" are so remote that it is almost as if anybody who understands the issue of nuclear power cannot be like you and me. He cannot be credible right from the beginning. You almost feel that he has crossed over some invisible line, that he has become a "they." And you cannot trust him.

On the other hand, there is the person who says, "There is a cover up. You have not been told the whole truth. You are not getting the straight facts. It really is even more dangerous than you think." That person has instant credibility. I think that our society is more vulnerable than most others in the world to such criticism. The most masterful statement on these tapes was Ralph Nader's judgment that, "All the public needs to know is that there is radiation in the nuclear power plant and it's a thousand times more radioactive than the blast at Hiroshima!"

We talk about mass phobias or irrational or exaggerated fears. We Americans are more vulnerable to shared fears for a number of reasons. First of all, we as a nation have more involvement with the electronic media. The impact of television is surely greater in the United States than anywhere else in the world. Also, we have a long-standing tradition of anti-authoritarianism that has registered an incredible increase during the last decade. We are less protected than most other cultures from our own inner fears because of our inability to trust people in authority—especially in nuclear power.

Now if Ralph Nader's opinion is the last word on nuclear power, then the answer is, "We've got to get rid of it." And that is his point, as it appears on these tapes. But it seems to me that one would want to know a whole lot more about nuclear power than that. You have to balance what the benefits are against the risks, to quantify both the risks and

benefits, and to be a lot more realistic not only about nuclear power but about the alternatives.

Following the Nader concept through, for example, let us take the automobile. If "all you have to know" about the automobile is that you can get killed by it, then you do away with the automobile. Or, if all you have to know about the airplane is that it can crash and kill you and that once you are on that plane there is nothing you can do to protect yourself, you would not go up in the air. If all you had to know about food is that you can get fat and have diabeties and heart attacks, you would, I suppose, do away with food. This is a very strange way to look at any issue. You can understand how absurd this position is if you think about water instead of nuclear energy. I can see the television picture closing in on a swimming pool, and the voice-over saying, "Do you realize that there is enough water in this pool to drown 100,000 people?" It is true, and it is the kind of statement we often hear today about nuclear energy. All these statements magnify our fears and remove meaningful perspective. This is a powerful technique of persuasion.

Q. *Walter Cronkite calls Three Mile Island a "nuclear nightmare." What sort of mental processes occur in a nightmare?*

A. Nightmare thinking includes, usually, the sense of the thinker not being able to do anything about a disaster. You are powerless. You are, in a way, a spectator. But you are vulnerable. When you wake up, you can do something about whatever it is that is bothering you. But you usually cannot in a nightmare, and that is the way phobic thinking develops. It is an involuntary process of blooming, buzzing, *what if*s. The phobic terror has a life of its own, like nightmares. The Cronkite analogy was correct in the sense of the Three Mile Island crisis being largely unreal, in the sense that the disaster did not physically happen. Calling Three Mile Island a nightmare captures the concept that it is something in your mind, that the terror is in yourself. But with Three Mile Island the terror was shared by millions of people, and I think that made it that much more difficult to cope with. That is what was unique about this mass phobic

fear, the sharing reinforces the fear and perpetuates it. The fear is authenticated by being shared.

There is a history of shared phobias. One that is often referred to occurred in the 16th Century following the discovery of the New World. Syphilis, apparently picked up by the explorers, went through Europe like a plague. People developed enormous, shared fears about syphilis. The French called it the Spanish disease; the English called it the French disease. It was not clear where it was coming from and how it was happening. It also had a moral dimension. In the 19th Century, the shared health phobia was tuberculosis. It became the symbol for risk, danger, vulnerability. Tuberculosis was the disease, and it could hit anybody. You did not know who was going to get it. In the 20th Century, the closest analogy is fear of cancer.

Q. *Some of the t-shirts that came out of Three Mile Island said: "We survived Three Mile Island". What did they survive?*

A. They survived fear, and I guess, terror. They survived the *what if*s; they survived the demons in their own minds, and those demons are the most frightening problem we can face. They are scarier than anything we have in real life, because we do not have the capacity to control our own nightmares.

Q. *Would you describe your reactions to the visual images on the tapes, in terms of fear or reassurance?*

A. Nuclear energy does not lend itself to good pictures. Even the logos that the networks used for nuclear stories were often negative. One logo often used is the sign of the danger of radioactivity, which is a fascinating choice because it is a clearly negative logo; a warning of danger. Another logo used on CBS was the hexagonal sign with an atom symbolized inside. While it lacks two sides of being the common octagonal "stop sign," it is so close in form that it is highly suggestive of the real thing. It implies that what we should do about nuclear energy now is to "STOP" it. Using that logo is like doing a show about medicines and constantly using the skull and cross bones as a logo.

Another logo that was used was the atom with the circling electrons around the nucleus and a plant or factory. That was better, more neutral. A recent logo the networks have moved to is a stylized nuclear plant. There is nothing very distinctive about a nuclear plant. Other than those big wide cooling towers, it looks like most other factories. Sometimes the networks use a picture of an atom bomb going off, or they use the footage of what is inside the nuclear plant. They showed, for example, the mechanical hand setting a rod in the reactor core. That has a negative connotation. It is alien and strange. Seeing the plants in a more human context is preferable. For example, it would be better to see the workers at the plant rather than the mechanical hand. When I viewed the tapes, I was reassured by the sight of the actual workers at Three Mile Island simply because they were obviously ordinary human beings. One of them was interviewed at the change of shifts. He appeared to be an honest, hard working guy doing his job.

***Q.** Do you feel that media people generally had a clear grasp of the subject matter?*

A. Although I heard several times on the tapes that nuclear reactors cannot explode, it did not get across clearly enough. The other thing that did not get across was the practical meaning of the "dreaded melt down." What does "melt down" really mean? What would happen if a melt down occurred? I heard sloppy descriptions about what that meant, but nowhere did I see an explanation of what the actual risk was, and how great it was, or what the outcome would be after melt down. Throughout the tapes, the fear was usually only partly articulated—hinted at darkly. I had a feeling that nuclear energy was alien to many newsmen and that they ought to have known more about it. It is important that media people be better educated about nuclear energy, or at least to have them have access to, and use, better educated advisors.

***Q.** Wouldn't that put the media "in bed" with the industry?*

A. There is some danger of that. They might lose some of their "credibility" if they knew more about nuclear energy.

Anybody who says anything that is not reinforcing the scare is now questioned. From that point of view, the fact that President Carter went to Three Mile Island was tremendously important. He put himself in the middle, personally, with his wife, at the site during the crisis. That was the kind of reassurance we need a lot more of. He physically went there. Reading about Three Mile Island and seeing it on television, you got the idea it was a very dangerous place to be until the President and Mrs. Carter arrived. To have the President and his wife physically go there undercut that scare image. The President's visit ironically occurred at the same time they were evacuating the pregnant women and the children from the surrounding area, and the fact that he would go there told you something important about the levels of radiation.

Q. Is fearfulness a near-universal reaction to nuclear energy?

A. No. As I watched the tapes, I was struck by the tremendous resilience most people have. The capacity of the public to endure risks and accept them is much greater than the media presentation would lead us to believe. There is something about the way the network producers select what we see which appears to exaggerate the risks and exaggerates the public opposition to nuclear power.

A lot of that resistance to fear on the part of the public has to do with ordinary denial. Many of us get through a lot of tight scrapes in life by simply not looking at the risks or saying, "so what?" and just going ahead. This fearlessness is not necessarily positive. These same characteristics let people, for example, ride a motorcycle, ride in a car without seat belts, smoke cigarettes and do a lot of other risky things. Within any population there are people who are more fearful and others who are less fearful. In retrospect you can say that fearlessness is more or less appropriate in different situations. I believe there is a lot more fearlessness out there about nuclear power than the media, in these tapes at least, leads a viewer to believe. The people who covered the news during the crisis at Three Mile Island often seemed to be surprised by that. They found, for exam-

ple, in the middle of the crisis, people who would not leave their homes near the plant. I remember one woman who said, in effect, "I'm not going to leave my home when they still have people on the Island. They have workers on that island; they're letting them go there. Then why am I going to leave my home a few miles away? It doesn't make sense. If it was that dangerous, they wouldn't let people on the Island."

Q. Then you did see some non-phobic thinking on the tapes?

A. There was a lot of sensible dealing with the immediate realities of day-to-day activities. I was struck by Pennsylvania Governor Thornburgh saying that he was impressed with the courage of the people of his state, who were going about living their lives. People have a tremendous capacity to deny risks. My own expectation of how the nuclear phobia will play out is that we will, as a nation, reach a point of boredom. Most phobic people get over their phobia by becoming bored stiff. The idea of going over a terrifying bridge another time is just of no concern; they have gone over the bridge so many times, in an anti-phobia program, that they overcome it. In overcoming any phobia the person must get into the phobic situation for this to occur. If he avoids the situation, it does not occur—the phobia persists.

The nuclear risk issue itself will not be resolved. The public will never resolve it, anymore than it has resolved the issue of airline safety. There is still a risk; it is still unpleasant to contemplate. So are coal mining and thunderstorms risky. We really do not resolve these issues of risk; we just get bored with them. It is like the 50,000 annual highway deaths. We are bored with that statistic. Or the cigarette smoking deaths: there are 300,000 excess deaths in this country from smoking every year. Everybody knows that, and we are bored silly by its restatement. That is not news. Yet here we have no deaths from nuclear power and it is a number one news item, while the 300,000 excess deaths from cigarette smoking is a non-item.

Q. That seems paradoxical. Why is this?

A. One of the major reasons is that we are bored with hearing about the *actual* health hazards of smoking, while we are terrified by the *potential* hazards of nuclear power. I think we will, one day, get bored with the nuclear fear too.

The contrast between fears of cigarette smoking and fears of nuclear power leads to another observation. The known and familiar, if devastating, health consequences of smoking are experienced by most smokers as resulting from their personal choice. By contrast the risks of nuclear power are risks an individual does not choose. They are imposed by remote and, for some, frightening "authorities," "politicians" and "bureaucrats." Many people are uncomfortable about being reminded that they have to change their lifestyles to improve their health. It is far easier to feel outraged about faceless bigwigs who are threatening us!

Q. What are some of your own views on the future of nuclear energy?

A. We must accept that it is impossible to establish a standard of a zero risk for nuclear power. When President Carter appointed the commission to investigate the Three Mile Island incident, I believe he said we have to prevent this type of accident from "ever happening again." Now if that is the standard, it is hopeless. Such a goal is analogous to saying, following the recent American Airlines DC-10 crash in Chicago, that we are going to prevent all further airplane crashes. That is an unrealistic goal. The only way to prevent further airplane crashes is to stop flying, and the only way to prevent nuclear accidents is to stop producing nuclear energy.

Q. What other ways would you suggest to reduce the public fear of nuclear power?

A Reassurance can help. Of course, reassurance—to be credible—must be realistic. The fact that President Carter and his family visited Three Mile Island told me something about what really was happening there, as opposed to *what if.* And that I found reassuring.

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Because of the devaluation of the nuclear establishment in the public mind, it will be essential in the next few years that much of this reasonable reassurance come from independent institutions with independent credibility. Major newspapers' editorials, foundations, health and energy organizations and even international organizations should play a role in educating the public about the facts of nuclear power. That means, among other goals, putting the benefits and risks of nuclear power into realistic perspective.

We can also reduce our fear by increasing our understanding of nuclear power and of nuclear plants in particular. More reporters and politicians and other ordinary citizens should visit nuclear power plants and learn more about them. The industry should take the initiative in establishing these contracts now, when there is no acute crisis, in order to help build a firmer foundation of understanding and personal experience with the every day, hum-drum aspects of nuclear power. Being able to label the elements of nuclear fear as unrealistic and distinguishing between the *what if*s and the *what is*s of nuclear power will help, too.

Finally radiation exposure—the most feared aspect of nuclear power generation—is uniquely measurable. Although it cannot be seen, heard, felt, tasted, or smelled, it can be easily measured. It would help many who now fear radiation from nuclear plants to have access to cheap dosimeters which they could use to measure their personal radiation exposure. While many people would have no interest in such a device—even if it were free—some people would use it and everyone would be reassured to know he or she could use one if he chose to. This would greatly increase the sense of personal knowledge and control. The lack of personal steps one could take to cope with fear now greatly contributes to nuclear fears.

Two recent developments could serve as useful models. The widespread practice of food labeling now provides concerned consumers with useable information about the nutritional characteristics of packaged foods. In the pharmaceutical area, the Food and Drug Administration is beginning to use "Patient-Package Inserts" providing the

patient directly with information about the drugs he's taking. While in both areas there are those who contend, not entirely wrongly, that most consumers don't care about this information and many of those who do cannot use the information in the form it is being presented, these two efforts represent pioneering efforts to provide information directly to those affected, information which responds to the deeply-held concerns expressed by many about food and medicines. Similar efforts should be developed in the nuclear area.

Q. *Earlier you said social progress can result from fear reactions. Does this mean that manipulation by fear is not necessarily bad?*

A. Yes. Fear is an effective tool in education. I earlier mentioned Ralph Nader. He, more than anyone else, helped us as a nation learn to "fear automobiles" and to focus on the staggering number of preventable deaths and injuries from driving. Similarly, many people and institutions are devoted to encouraging fear, and reducing denial of danger, of smoking cigarettes. To be effective, and the resulting fear of auto accidents and cigarette smoking have meant substantial savings of lives in the last decade, there must be constructive steps which can be taken to reduce risks. Some of these steps can be taken by individuals—wear seat belts; stop smoking, or smoke lower tar and nicotene cigarettes—while others can be taken only by institutions—design safer cars and highways; eliminate TV advertising for cigarettes. The challenge today to the nuclear power industry is to find ways to channel these widespread nuclear fears in constructive ways, both for institutions and for individuals. The American Cancer Society has done a wonderful job of channeling public fear of cancer into support for research and treatment for cancer victims. More appropriate to our current discussion, the Cancer Society has popularized the "Seven Danger Signals" of cancer and encouraged self-care. They reinforce medical care and give the fearful person something he can personally do to help reduce his risk of cancer. Thus, promoting fear can be useful in solving problems. Denial of problems is not always

helpful: the woman who finds a lump in her breast and denies it telling herself "there is nothing wrong" is not helping herself, even though in the short run she may reduce her fear.

Q. You do believe that widespread fear of nuclear energy will eventually die out?

A. I think it will in time. But meanwhile nuclear power advocates must recognize that for any mass fear to persist, it must strike a deep, responsive chord in the public consciousness. To deny this reality and treat nuclear power only as a complex technological problem will simply increase fear and further erode the public's confidence in nuclear experts. My point in conclusion is simply that, if nuclear power is to play a meaningful role in our energy future, this fear must be accepted and dealt with.

APPENDIX:

Excerpts from: *Mental Health Aspects of the Peaceful Uses of Atomic Energy*

(WHO Technical Report Series No. 151. Geneva: 1957)*

At the United Nations International Conference on the Peaceful Uses of Atomic Energy, held in Geneva in August 1955, Professor W. V. Mayneord said: "The peaceful development of atomic energy is humanity's greatest adventure, and like all adventures, must involve risks." (p. 3)

Under the auspices of the World Health Organization, the Study Group on Mental Health Aspects of the Peaceful Uses of Atomic Energy met in Geneva from 21 to 26 October 1957. More than two decades later the report of the study group remains a blueprint of human behavior in the face of the dawning of a new technological era.

In the opening section entitled "The Personal Challenge of Atomic

*Reprinted by permission of World Health Organization, Geneva, Switzerland.

Energy," the report dealt with the possible emotional reactions to the use of atomic energy. It said, in part:

> It seems possible that the advent of atomic power may also elicit more specific kinds of psychological reaction. Radiation energy is indeed liable to arouse anxious associations on account of man's first experience of contact with it. In medicine, ionizing radiations were first used for the diagnosis and treatment of some of the most awe-inspiring diseases, like tuberculosis and cancer. On the other hand, humanity's first contact with nuclear power proper was the explosion of the atom bomb. There is indeed evidence that it is exceedingly difficult for many people to keep the productive uses of atomic energy clearly separated in their minds from its destructive possibilities and that this inability contributes to making the whole concept of atomic energy potentially a frightening one.
>
> Moreover, as atomic energy is so gigantic a force emanating from exceedingly small quantities of matter, and cannot be seen, heard, smelt, tasted or felt, it easily provokes irrational phantasies. Such phantasies may well be related to those of childhood —magical power, the casting of spells, the working of miracles and so on—dreams by which children compensate for their felt smallness and weakness. Being of very early origin in the emotional life, these childhood phantasies are normally hidden in the unconscious mind, but are likely to arouse strong emotional reactions, the origin of which remains largely unknown to the conscious mind, whenever they are triggered off by actual experiences of a psychologically similar nature. (p. 5)
>
> As a corrective it must be recognized that these more specific reactions to the advent of atomic power need not always lead to psychological states which might be termed pathological. Very much to the contrary, there is in many people a healthy ability to think and act rationally in spite of exposure to dangerous situations. It is obvious that in the mental as in the physical sphere the forces in humanity tending towards health and integration have always greatly outweighted the influences causing ill-health and disintegration. Were it otherwise the human race could not have evolved. Because much of this report is devoted to the study of less favorable types of human reaction, it must not be concluded that the Study Group can see only the bad and unwholesome in human nature. On the contrary, the sciences of human behavior have thrown into sharp relief man's incredible powers of health adaptation. But truth will not be served by ignoring the fact that there are people, sometimes even people in highly responsible positions, whose behavior is not entirely free from reactions which, on account of unconscious emotional motivation, represent unhealthy responses. Reactions of this latter type can certainly not be left on one side when the mental health aspects of the peaceful uses of energy are being discussed.

> Thus there seems to be evidence that the advent of the atomic age has confronted humanity with certain mental health knowledge in order to confront these problems scientifically and not merely from the point of view of popular surface psychology with all its fallacies. (p. 6)

The report summarizes in a discussion the unhealthy emotional responses arising with the advent of nuclear power.

> There is, however, reason to believe that certain emotional responses are provoked by the advent of atomic energy also in a more direct manner and must in many instances, be considered as pathological. These responses, which seem to be due partly to the circumstances in which atomic power has been introduced and partly to its very nature, constitute perhaps the most important mental health aspect of the peaceful uses of atomic energy.
>
> These unhealthy reactions appear to stem from anxiety, and from attempts which human beings make to deal with anxiety. Thus they may be manifested in the form of irrational fears, irrational hopes, or irrational power. Among these reactions, the most frequent is undoubtedly irrational fear, and this fact is certainly of the greatest importance for any analysis in this field. (p. 12)

* * * *

Thus, in the modern world, people are becoming aware of their subjection to vast and dangerous forces, while at the same time they are mystified and filled with uncertainty—a situation which is peculiarly prone to set off regressive tendencies and so lead adults to return to less mature ways of thought and feeling. The more childish beliefs and phantasies thus evoked will not only constitute poor social and mental health conditions, but will defeat their object in the long run. There is some reason to expect that the greater the threat, the deeper and more difficult it will be to modify the regression, and there can be no threat that is felt to be more dangerous than that which extends into the future. People are afraid that the potential destructive force of the atom may affect not only themselves but also their children, and hence there may be a loss of a sense of self-perpetuation, a loss of their future in their children.

In addition to these almost universal reactions that may appear in varying degrees, there are certain specific situations to consider. Many people in government, and many elected representatives, have a feeling that Pandora's box has been opened, and that anything can happen now. Combined with this sentiment they may have a sense of guilt for having waited too long before

attempting to control the situation or for not having taken steps that still could be taken. In this respect, it might be said, for instance, that some people in the more developed areas seem to fear the economic and social shifts and the possibility of loss of present living standards as a consequence of a rapid industrialization of the countries in process of development. The fact that as yet only some initial steps have been taken to provide for this evolution and to inform the public about the concrete possibilities may reinforce the uneasy sense of undischarged responsibility that some leaders may have, and so add to the general reservoir of free floating anxiety. (p. 29)

Although there are some aspects of the fear of atomic power which appear to be equally characteristic of the dread of many other agents deemed to be noxious, the phenomenon seems to have qualities and mysteries which are peculiar to itself. Thus, the risk of being killed in an automobile accident, which is immediate and visible, and the danger from tobacco, which is delayed, both appear as much more real and credible threats than the dangers of radiation, yet most people continue to drive and smoke without apprehension. It has been suggested that the peculiar qualities of radiation are that it is invisible, unheard, unsmelt, untasted and unfelt, apparently infinitely powerful, yet springing from an almost infinitely small source, and—as the individual is concerned—uncontrollable. (p. 30)

The report addresses the interaction between scientists, authorities, and the general public and states:

The political leaders may, in fact, be in a constant state of anxiety lest they be faced with what they will regard as a scientific fait accompli. They have not the necessary background, as has been stated, to foresee the ultimate implications of scientific work. As for the general public, it is apt in the general bewilderment to show distrust of both parties and to suspect that the political leader instead of being the master of the situation is, in fact, caught between the scientists and the next election.

Scientists do not make the task easier when they vacillate between statements which are limited to their scientific competence and statements which have the mantle of science but which are actually expressions of value and even of policy decision. Some pronouncements which have appeared with regard to the "maximum permissible dose" of radiation illustrate this. It has been pointed out that it is right, even the duty, of scientists to give an opinion on a scientific matter, but they might do it in a way that will avoid any confusion between facts and judgments on facts.

However, it is evident that authorities, by and large, are quite

inconsistent in their demands upon scientists, sometimes asking for fact and sometimes ardently seeking opinion. For this and other reasons scientists are frequently driven into groups in which opinions conflict with reference to the same data, as, for instance, in the case of a divergence of views between physicists on the one hand and geneticists and other biologists on the other. Moreover, scientists are sometimes moved by very strong pressure from the public and from the authorities to commit themselves with regard to the significance of their findings before they have had a chance to think through the implications and define the limits of their knowledge. Very often they are led to spend a great deal of time trying to formulate expressions of opinion about their findings, time which is badly needed for further research into meaning. This kind of pressure, particularly in medicine and the physical sciences, is a new phenomenon, at least in its prevalence and urgency, and may have serious repercussions for science as well as for the levels of anxiety and confusion between scientists, authorities and the public. The difficulties encountered for a time with the Salk vaccine may be traceable to a situation of this sort.

A further difficulty is in the nature of communication between scientists and non-scientist. The latter may be trained to think in arbitrary terms requiring "yes" and "no" answers and may in consequence be bothered by the scientist's answers in terms of gradation and multiple qualifying considerations. Wherever the authorities' need to distinguish "black" from "white," to define a "right" answer and a "wrong" answer to every problem is for some reason excessive this pressure for what might be thought of as "bipolar" thinking and decision making is bound to be a source of great exasperation, misunderstanding and irrational decision: the authorities feel they are getting answers which are impossible to use, while the scientist feels he is being confronted with unanswerable questions and coerced or tempted into committing himself. (p. 35-36)

Furthermore, the report discusses the role of the media as follows:

In attempting to survey newspaper attitudes, the specific concern has been with practices and conditions which may have adverse effects on public morale and mental health, and which may reflect undesirable emotional states on the part of the journalists themelves. It would only be fair to the profession of journalism to state that all the evidence points to the conclusion that, on the whole, the work and the attitudes of journalists with regard to atomic energy are constructive. At least there is no evidence in the actual subject-matter published of the irresponsibility and lack of integrity with which journalists are frequently charged. There are, however, also certain disadvantageous aspects to which attention should be drawn.

A notable feature is the headline. Although the actual content of a "feature" or "story" in the popular press is usually accurate, well-planned and sober, the readers' attention is frequently caught by "scare" headlines. For example, one article was published with the intention of reassuring the public about radiation hazards; it had been carefully worked out and submitted to nuclear scientists for approval, but it appeared under the banner: "ATOMIC SUICIDE." It can be said in general that, as far as the popular press is concerned, the reading of newspaper headlines only, and not the relevant articles or news stories, will give a totally false sense of balance on almost any topic. In particular, the "scare" headline appears more frequently in the popular press than in the papers aimed at a more educated readership. (p. 18)

The tacit newspaper principle that "bad news is good news" has implications for mental health and morale that are worthy of serious attention. It is noteworthy that, in the above quoted sample, the letters which reached the editor of the popular daily newspaper (and this seems to be a general experience) were in marked contrast with the actual articles appearing in the paper. However, in reflecting disturbed and irrational feelings, the sentiments expressed in the letters showed no contrast with the message of the headlines.

The evidence of the headline throws emphasis upon the very special position of responsibility occupied by journalists, standing as they do between events and the public, and between the public and the authorities and scientists. Journalists are the purveyors of news and thus, are potentially the creators of attitudes; there is also the possibility that they can be the creators of news, or, at least of significant changes in news.

At the same time, it should be recognized that newspapers are not primarily concerned with sustained public education. As they see it, their job is to collect, formulate and distribute information of a type that will interest the public. Moreover, the staff of a large journal comprises a cross-section likely to show all the different sentiments with regard to atomic energy that are shown by the public. Thus there will be realism, but there will also be fear, confusion, anger, apathy, repression and a turning to psychological substitutes. Most journalists lack training in scientific subjects and ways of thought and many show something of an anti-scientific bias. There is evidence of vacillation and inconsistency; at one time a very careful job of reporting will be done with all due regard to verification by informed people; at other times, a news item coming in from a distance will be taken without critical evaluation as to source or substance. (p. 19)

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MAR 19 1980

Analyst says TV creates 'N-phobia'

WASHINGTON (UPI) — A psychiatrist says 11 years of network television evening news reports on nuclear energy promoted "nuclear phobia."

Dr. Robert L. DuPont, president of the Institute for Behavior and Health, defined a phobia as "fear based on an exaggerated, unrealistic danger."

DuPont analyzed network television's impact upon public attitudes on nuclear power for The Media Institute, a non-profit organization financed by a broad spectrum of American industry, including companies active in nuclear power.

He reviewed 13 hours of videotapes including all ABC, CBS and NBC evening news reports on nuclear power from 1968 through last year's Three Mile Island accident. His report was released yesterday.

DuPont said one of the "most striking characteristics I saw over and over" was reporters pursuing the "what if," worst-case possibilities of nuclear mishaps.

"That is exactly what happens with phobic people," he said. "The problem becomes the 'what if' rather than the 'what is.'"

DuPont said the television tapes lacked balance. Rarely, he said, was the risk of a nuclear accident weighed against the risks of alternative power sources.

"I saw no perspective in these TV tapes about the risks of alternative forms of electrical power generation — risks for the workers in the plants or for the public."

DuPont said he was not saying opposition to nuclear power was wrong or that support of nuclear power is right.

"My point in conclusion is simply that, if nuclear power is to play a meaningful role in our energy future, this fear must be accepted and dealt with."

Broadcasting Mar 31 1980
81

Psychiatrist says TV coverage of nuclear issues has led to phobia about disaster

A psychiatrist known for his expertise in phobias has pointed an accusing finger at TV. He says network television evening news coverage of nuclear events has fostered inordinate fears in viewers.

The charge was made by Dr. Robert DuPont, president of the nonprofit Institute for Behavior and Health. It came in a discussion with The Media Institute of the latter's study of 11 years of network TV tapes that dealt with nuclear news (BROADCASTING, Feb. 11).

The Media Institute is a Washington-based organization supported by business and devoted to improving the quality of press coverage of business and economics.

DuPont explained that phobia is "fear based on an exaggerated, unrealistic danger." He said that in his review of the institute tapes, "one of the striking characteristics I saw occur over and over was the reporters continually going down those what-if, worst-cases branches. That is exactly what happens with phobic people. The problem becomes what-if rather than the what-is."

DuPont said that TV offered people in various roles on camera who were afraid: critics of nuclear power and even commentators who are afraid.

DuPont felt that media people generally did not have a clear grasp of the subject matter. "I had a feeling that nuclear energy was alien to many newsmen and they ought to have known more about it. It is important that media people be better educated about nuclear energy or at least to have them have access to, and use, better educated advisers."

In a plea for perspective on the seriousness of nuclear risk, DuPont cited the high number of deaths from other causes and said everyone had become "bored" with those statistics. "Yet here we have no deaths from nuclear power and it is a number-one news item, while the 300,000 excess deaths [annually] from cigarette smoking are a non-item," he said.

NEWSDAY, TUESDAY, MARCH 25, 1980

TV accused of creating a 'nuclear phobia'

The Associated Press

A psychiatrist known for his work in treating phobias has concluded that television news coverage of atomic power plants emphasizes fear to the point of creating a "nuclear phobia."

"One of the striking characteristics I saw occur over and over was the reporters continually going down those 'what if,' worst-case branches," said Dr. Robert L. DuPont. "That is exactly what happens with phobic people. The problem becomes the 'what if' rather than the 'what is.'"

DuPont, an associate clinical professor of psychiatry at the George Washington University School of Medicine and president of the non-profit Institute for Behavior and Health, was asked by the Media Institute to review 13 hours worth of stories on nuclear energy broadcast by the three major networks between 1968 and 1979.

The institute, a non-profit foundation supported by the business community and the Scaife Family Charitable Trust, issued its own report on the TV stories last December.

It concluded that television had failed to present information that would allow the average viewer to make a rational decision on the risks and benefits of nuclear power. The institute then sought DuPont's analysis to provide "'insights into the effects of mass communications on human behavior."

DuPont acknowledges in his analysis that he personally thinks "it is impossible to establish a standard of zero risk for nuclear power."

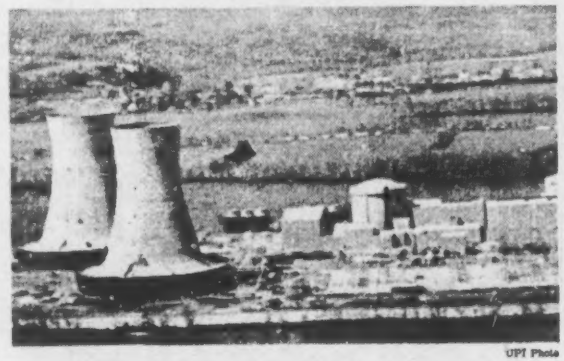
"Such a goal is analogous to saying, following the airplane crash in Chicago, that we are going to prevent all further airplane crashes," he said.

The issue then, according to DuPont, is whether the public is being informed in such a way that it can balance the risks of nuclear energy against the benefits.

"Fear was the motif of the entire series of nuclear stories," DuPont said. "There is no question in looking at these tapes that the public debate is primarily going to hinge—not on the technology, not on the economics, not on the alternate energy sources—but on the fear."

DuPont defined a phobia as a "fear based on an exaggerated, unrealistic danger."

Spokesmen for ABC, CBS and NBC said they had not reviewed DuPont's analysis and had no comment, although David Fiske of CBS observed: "It sounds fairly esoteric." Leonard J. Theberge, executive director of the Media Institute, said he had not received any network comment on the institute's findings in December. /11



UPI Photo

The Three Mile Island atomic power plant outside Harrisburg, site of a nuclear accident last year.

The New York Times

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Topics

Fearful / Footloose

Disassembling

The nuclear establishment has always been good at transmuting accidents into "incidents" and explosions into "energetic disassemblies." So it is no real surprise that the Nuclear Regulatory Commission has just ruled that whatever happened at Three Mile Island was not an "extraordinary nuclear occurrence."

That may well be right technically. The releases of radiation do not seem to have been great enough to qualify as extraordinary under the Atomic Energy Act. But what, then, should citizens call this "event," which crippled a reactor, drove many from their homes and terrorized much of the public? Surely it wasn't ordinary, but there is as much danger of rhetorical overkill as of understatement.

We nominate "nuclear nightmare," a phrase that once seemed alarmist but is itself undergoing transmutation. During the crisis, the nightmare was that our worst fears had come true. But they had not; the accident was contained. So now Dr. Robert DuPont, a psychiatrist who specializes in phobias, suggests that Three Mile Island was a nightmare in another, more accurate sense — a disaster only feared, a terror in the mind. Eventually, he thinks, the nation will become "bored stiff" with this nuclear phobia, just as it became bored with 50,000 deaths on the highway each year, and 300,000 from smoking. The nuclear risks will continue, but boredom will have conquered fear.

the media institute
1627 K STREET, N.W. • SUITE 201 • WASHINGTON, D.C. 20006 • 202 466-4215

26 THE WALL STREET JOURNAL, WEDNESDAY, APRIL 30, 1980

REVIEW & OUTLOOK

Nuclear Phobia

Television gets the blame for much that goes wrong in our world and probably unjustly so in many cases; such is the price of TV's success in attracting a mass audience. It may well be, however, that TV has something to answer for in itts handling of the Three Mile Island nuclear accident last year.

That, at least, is the view of Robert L. DuPont, professor of psychiatry at the George Washington University School of Medicine, in a study recently published by the Media Institute. He thinks the TV coverage injected irrational phobic fear into an already controversial subject.

The network news, says the professor, encouraged phobic thinking by focusing on the worst possible "what ifs." "One of the striking characteristics I saw occur over and over was the reporters continually going down those *what if* worst case branches. That is exactly what happens with phobic people. The problem becomes the *what if* rather than the *what is*."

Imagine, says Dr. DuPont, a TV report on the hazards of swimming pools with the television picture closing in on a swimming pool and a voice saying "Do you realize that there is enough water in this pool to drown 100,000 people?"

The phobic pitch to Three Mile Island coverage was not entirely the fault of the networks. Fear made the news because people find fear interesting--as shown by the long lines at amusement parks for the scariest rides.

The most disturbing thing about it all is that to keep the entertainment value of the big scare going, the credibility of knowledgeable people has to be destroyed. The experts became "they," and "they" were industry spokesmen in bed with greedy interests risking innocent Americans for a buck. The fear-monger technique of questioning anyone who didn't reinforce the scare took hold and made it difficult for people to get a realistic perspective.

Back in 1957 the United Nations World Health Organization warned that "it is exceedingly difficult for many people to keep the productive uses of atomic energy clearly separated in their minds from its destructive possibilities" and that "this inability contributes to making the whole concept of atomic energy potentially a frightening one."

In view of the Kemeny Commission's report that the principal effect of the Three Mile Island accident on humans was "mental stress" caused by misinformation, WHO's 23-year-old warning bears repeating. The emphasis on fear stands between the public and a reasoned assessment of the positive and negative aspects of atomic energy.

Mrs. BOUQUARD. Thank you very much for your valuable testimony, Dr. Dupont. We will continue the questions for both of you.

Dr. Dupont, the view that the public's attitude toward nuclear energy would be more favorable if increased information was available rests really on two assumptions, one, that public attitudes are primarily cognitive in basis and, two, that increased knowledge supports an improved attitude toward nuclear energy.

Do you feel attitudes are formed on a rational basis or could public attitudes toward nuclear energy remain unchanged or even become more unfavorable if it had more information?

What I am trying to get out of your testimony, will a debate help in promoting better understanding?

Dr. DUPONT. Will information, will knowledge itself solve the problem of fear of nuclear power?

Mrs. BOUQUARD. That is the point I was trying to ask you.

Dr. DUPONT. There is a limitation to what knowledge can do to reduce fear.

As you may know, I am the president of the nonprofit Phobia Society of America. I do a great deal of direct clinical work with people who have extreme irrational fears, often of technologies such as elevators, airplanes and freeways. Most of the time these phobic people have the knowledge about the health safety.

In other words, for the person who is afraid of flying, and there are 25 million people in this country who are afraid of flying, a simple recital of the statistics about probabilities of crashes doesn't get him on an airplane. He will say, "But this plane could crash," and, of course, no one can say it could not crash.

That is what I call "what if" thinking. It is projecting into the future, and that process is exactly what has dominated our nuclear debate.

People who fear nuclear power will say, "Yes, you have 25 years of no radiation injury from civilian nuclear powerplants, but tomorrow or this afternoon we could have a disaster—Who can say that it couldn't happen?"

The importance of facts, of knowledge, can be understated as well as overstated. It can be overstated in the sense that simply presenting information will not solve the problem.

On the other hand, in the absence of clear statements of facts, irrational fears tend to spread and be reinforced by the sense that this is a reasonable fear. It is important in dealing with a person who has an excessive, inappropriate fear to start off with a statement of the facts. When I talk with someone who has a fear of flying I do not spend a lot of time on the statistics about airplane safety, but I do spend enough time so that we have a common ground to understand what the reality is outside the fear. I also emphasize that this is not a matter of theory for me: I fly once or twice every week. Then successful treatment of a phobic person requires something that is not cognitive in the usual sense: it requires actual personal experience in the phobic situation. Most people in the United States have no exposure to nuclear powerplants. They tend to exaggerate enormously, the scariness is of this energy source and they are easy victims of fear mongers.

I can tell you, having been, until quite recently, not particularly interested in nuclear power—until the Media Institute study came

along. I had never visited a nuclear powerplant, and never focused particularly on the issue of nuclear power.

My first visit to Three Mile Island was an emotional experience for me. I had spent hours studying all the television news coverage of the accident in 1979 and I was, if you will, sensitized to this fear. The stunning thing to me was that here was the most awful nuclear accident, this terrible, dangerous problem, and I went there with a sense of excitement. What did I find?

Well, from my point of view, the cooling towers—which I called "smokestacks" at the time—instead of seeming as big as the Empire State Building, which they had, to me, on television, actually seemed almost small. The plant itself at Three Mile Island was one of the smaller industrial plants that I have visited. The workers, rather than walking around in a frenzy and in terror, seemed to be rather ordinary people going about their business in a rather ordinary fashion. Talking to the neighbors of the plant was also reassuring.

My visit to TMI did not induce fear. In fact it had quite the opposite effect on me. We need a lot more personal exposure like that for the American public.

The biggest selling tourist item at the greenhouse store across the road from TMI is a T-shirt which says, "I didn't die at TMI." This dramatic contrast between the fear of nuclear power on the one hand—especially fear of TMI—and the almost humdrum experience of visiting the world's most famous, nuclear power plant on the other makes this T-shirt a best seller. It gives a strong signal for both what is wrong with TV news coverage of nuclear power and what the public needs if it is to kick its nuclear fear habit.

The nuclear industry ought to have schoolchildren come to visit plants, ought to organize bus tours, to go to the plants, see the plants, talk to the workers, and see nuclear power as an ordinary part of our communities and our lives.

One minor but important tragedy is that in the interests of protecting the public from a relatively remote risk of radiation, these nuclear power plants are sited away from population centers. If you take seriously, as I do, the idea that fear is the No. 1 health threat from nuclear power, you see that we have, by our siting, magnified the fear. In terms of the fear, the plants ought to be located downtown in our large cities, so that people could see them. This in fact happened in Toronto, Canada, where there are several nuclear power plants in one installation in suburban Toronto, Canada's largest city. I have talked with many people from Toronto about that, and the experience of driving by those plants every day does reduce fear.

Mrs. BOUQUARD. Thank you very much.

Mr. Winn?

Mr. WINN. Thank you, Madam Chairman. Dr. DuPont, I think I recognize a name and a face that appeared before the Crime Committee many years ago.

Dr. DUPONT. That is right.

Mr. WINN. 1971, 1972, in there.

Dr. DUPONT. Yes, sir.

Mr. WINN. We were checking the effect of drugs.

Dr. DUPONT. Yes.

Mr. WINN. On the crime pattern in those days. It sure has not gotten any better, has it?

Dr. DUPONT. We had some good news and now we have got some bad news, that is right. Things have gotten worse again in the last year.

Mr. WINN. Nice having you back again.

Dr. DUPONT. Thank you. Mr. Winn, I would like to make one comment about my work in drug abuse prevention. For many years I spent a lot of time trying to get people to be more afraid of something, namely drugs, so that they would not use them. I find it ironic that I am now talking about ways of overcoming fear. The contrast between the two problems is illuminating.

We have thousands of people dying of drug overdose deaths and still they do not fear drugs. By contrast, we have tens of millions of Americans who fear nuclear power which has killed no one. The principles I outlined in my prepared remarks explain that paradox. Health risks which are spread out over time, which are familiar and which the person perceives he controls are minimized. These principles explain why we have a minimum fear of drugs, particularly among the drug users themselves who are familiar with the drugs, and a maximum fear of nuclear power.

Mr. WINN. Thank you very much. We will leave that in the record just for educational purposes.

Mrs. BOUQUARD. I thought it was very interesting, his comment that fear is the No. 1 threat.

Dr. DUPONT. The No. 1 health threat from nuclear power over the last 20 years is fear.

Mrs. BOUQUARD. From nuclear power?

Dr. DUPONT. When you read the Kemeny Commission Report this becomes clear. That report was highly critical of many institutions including the nuclear power industry, but if you look at it from a public health perspective you see that the health injury, the harm that was done in that accident, was what they called a severe mental stress, or what I call fear.

That was the only health damage that was done in that terrible accident at TMI.

Mrs. BOUQUARD. Thank you.

Mr. WINN. Talking about Three Mile Island, I went up there 3 days after the accident, and we had about five or six Members of Congress, a couple of staff people, and I do not believe that any of us sensed a fear. We were so concerned about how would an accident like that happen.

Dr. DUPONT. Yes.

Mr. WINN. And what happened, and what the political ramifications were, and the notification and the communication between the Governor's office and all of the people involved.

Dr. DUPONT. Yes.

Mr. WINN. I do not believe any of us expressed or sensed any great fear.

Dr. DUPONT. Did you have fear before you got there?

Mr. WINN. No.

Dr. DUPONT. None at all?

Mr. WINN. No; we went to a motel close by, talked to people that lived there. There did not seem to be any great fear.

Dr. DuPont. Right.

Mr. Winn. Among the waitresses, people that worked in the motel. We talked to people going in a little grocery store, and one told us that they thought about leaving the area, but they changed their minds.

Dr. DuPont. Yes. When you came back and told people here I bet people did not believe you when you told them that people were not afraid at TMI.

Mr. Winn. Correct.

Dr. DuPont. Because they think everybody there——

Mr. Winn. They thought it was a rat race up there, that everybody had gone crazy.

Dr. DuPont. That is right. That was the national perception of what was going on, that TMI was a very scary experience and that everybody up there was in a frenzy. I have talked to others who were there right at the time the accident was happening. Rather than having the highways choked with traffic as people fled, the highways were empty. Rather than terror there was a sense of camaraderie and even excitement. But very little fear.

Mr. Winn. There was no such thing. As a matter of fact, we had a parliamentary delegation from Europe over here the day we got back, which was about 4 or 5 days after the accident, and they were just intrigued on our perception and our expression of what we say, and asked a lot of questions, and they could not believe from what they had read in their press and the coverage that things were pretty much going on a daily basis up there, on a normal basis.

Mr. Theberge. Mr. Winn, I think you have put your finger on something very important. Certainly there was a great disparity between the perceptions of the public outside of the area as to what occurred there, and the reality of what did occur. I think television was a factor here, because most people get their information from television. In particular, during that period there were over 6 hours of network news coverage about Three Mile Island in a 24-day period.

Putting that in perspective, during the entire 10 years prior to Three Mile Island, the networks devoted 7.5 hours to nuclear coverage, or less than 1 hour per year for all three networks. Certainly I think the perception of the general public, including myself here in Washington, was that there might be a terrific cloud of radioactive dust coming down from Three Mile Island. We certainly detected this fear during our research on this.

Mr. Winn. I think many of us that have supported nuclear power for quite some time really felt pretty good about what we saw. That sounds like a stupid statement to make, but I am talking about the difference from the perception that we had received from the early days of the press, and I remember the Washington Post, for instance, a few weeks later, a few days later had eight pages, eight pages, full pages, devoted to about 18 writers and correspondents that participated in that special section on it, and had I read that before I went up there, I do not think I would have gone. That would have scared me to death, not that some of the information was not factual, and not that there were not some problems up there, which management explained and which we could see.

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If you know anything about control rooms, some of the lights are out and some of the personnel are just a little too laid back, why you are going to have some problems.

I am puzzled over one point, Mr. Theberge. Cambridge Reports, Inc., did a survey of the public attitude regarding the disposal of nuclear waste, and of course that is still a problem. The survey indicated that the more the media cover nuclear issues, whether with positive or negative bias, the greater the public concern about nuclear energy. This means that the public sees media coverage as an indicator that there is a problem, and conversely, if there is no media coverage, there is no problem.

Would not more coverage signal to the public that there are more problems, regardless of the realities, and how do we overcome this aspect?

Mr. THEBERGE. I do not know whether the premise that public attitudes are not affected by bias one way or the other is true, but I think as Dr. DuPont pointed out, the question of more information and valid information, while generally helpful in reaching any kind of a rational assessment, certainly cannot be deemed to be the only factor which weighs on the consideration of the effect on attitudes of the public.

I tend to feel that the rational discussion and presentation of information is always beneficial, and that it would be helpful in the long run.

Dr. DUPONT. Mr. Winn, could I make a comment?

Mr. WINN. Sure.

Dr. DUPONT. I have seen several reviews of the 1970's, each identifying the Three Mile Island accident as one of the top 10 stories of the entire decade. I am fascinated that TMI was totally a "what if" story. There was no substantial story about what was. TMI was a "what if" story about what "almost happened." The media is quick to dish out criticism, but highly sensitive to any criticism of itself. The media I have found is resistant to the idea that what they were excited about was "what could happen," or "what if."

I see down at the end of this hearing room the name Skylab. That was another classic "what if" story of Skylab coming down. The question was where was it going to land and was it going to land on my head? No expert was able to say for certain that Skylab was not going to land in Times Square at noon when everybody was out walking the streets. That was another tremendous "what if" story.

In resonse to your question of Mr. Theberge, when an individual or a group of individuals or society confronts their fear, there is an initial peak of anxiety, of distress, at the time of the confrontation. When a person who is afraid of an elevator gets on the elevator, he is more fearful at that moment than if he does not get on the elevator.

On the other hand, however, there is a decline in his fear reactions if he stays in the fear-producing situation. That is how we help people work with fear reactions called phobias. They learn that in the short run you are going to make the problem worse by confronting it but in the long run you are going to solve the problem. The Cambridge Report Survey you mentioned missed this basic principle. In the short run when people are exposed to these fearful ideas

or experiences, they do tend to confirm their fears. They do create more fear reactions. In the long run, however, confrontation is the only way to solve the problem of fear.

To pretend that fear of nuclear power does not exist, and to pull back the media coverage is the equivalent of solving the problem of a bridge phobia by not going over the bridge or solving airplane phobia by trying to do away with airplanes. Those are not effective ways of solving the problem, even though the person who has this fear reaction may find that in the short run avoidance is the more comfortable approach.

Mr. WINN. You mentioned Skylab. I will never forget a hearing that we held here. You have to bear in mind that most of us on this committee have great faith in NASA, even though most of their work is still at the research and development stage, but we had a hearing here, and the day before the hearing or a few hours some enterprising mind distributed hardhats to the members of the committee, just before Skylab was to come down.

Needless to say, only one or two of the clowns wore them. I do not think any of those clowns are here now.

Speaking, Mr. Theberge, of your statistics, and you had some very intresting ones, particularly about the television news stories that were biased against nuclear energy, do you have anything that shows us what percentage of that news coverage was actually biased pronuclear?

Mr. THEBERGE. Yes, we do.

Mr. WINN. As far as being antinuclear.

Mr. THEBERGE. Yes, sir. I would like to note one of the measures of bias, the one which dealt with the opening statements in nuclear energy stories. We found prior to Three Mile Island that 1.4 percent of opening statements introduced a positive bias, compared to 17 percent with a negative bias, while the large majority of opening statements, 81.6 percent, were neutral. But during Three Mile Island, March 28 to April 20, 1979, the number of opening statements with a negative bias went to 47 percent, with only 6 percent of openings considered positive, and just 47 percent neutral or objective.

Mr. WINN. You could almost say that was slanted news then, could you not? If the percentages bear out the negative stories versus the positive stories, it would seem to me that that could come under slanted news.

Mr. THEBERGE. It was during that 24-day period, Mr. Winn, that the Three Mile Island story received more attention than any other major scientific event of the decade or even the previous decade, including landing on the Moon, which was quite a signficant achievement. Certainly the nature of news is to point out dangers and risks, so there would be a tendency to emphasize and overstress these negative elements.

Mr. WINN. No one was killed in that accident.

Mr. THEBERGE. That is correct.

Mr. WINN. To my knowledge, and correct me if I am wrong, no one has suffered long-term illness, sickness, injury?

Mr. THEBERGE. I do not know of any.

Dr. DUPONT. That is right. Using the most extreme projections, the Kemeny Commission concluded that there might be seven-

tenths of one increased cancer death over the lifetime of the people living within 50 miles of Three Mile Island on the basis of the additional radiation exposure from the accident. That is truly insignificant when one recognizes that this group of people is expected to suffer 325,000 cancer deaths unrelated to nuclear power during the lifetimes of this population.

Mr. WINN. Then to follow up, there were some surveys that showed the percentage, there have been some surveys I understand, that show that the percentage of antinuclear sentiment is higher among members of the news media than among the general public. Is that so?

Mr. THEBERGE. I do not know. I really do not know the answer to that.

Mr. WINN. Did you ever see any survey or testimony on that?

Mr. THEBERGE. I have not seen them. I have heard that statement. There is some evidence certainly, I have heard news directors of television stations claim that they have difficulty with their reporters keeping a balanced perspective on it.

Mr. WINN. We have trouble with staff that way, too.

Mr. THEBERGE. I am sure. Yes, I think when you are involved in the formulation of news, you tend to get enthusiastic about it and try and make a story.

Dr. DUPONT. Mr. Winn, could I comment on that in terms of the political landscape. There are three factors I mentioned that lead to the exaggeration of risk about nuclear power. One of them was whether the danger comes as one big event, or whether it is spread out in time and space. In this regard the media plays a central role. The media can cover an airplane crash in which 130 people are killed and make it a big, big story. By contrast 130 people killed a day on the highways—our usual rate—is not a story because it is spread out in space and time.

The second area of risk distortion needs to be emphasized and that is the question of who controls the risk. That is essentially the area in which political activism in the antinuclear movement comes in. This movement is not concerned so much with health or safety as it is with the question of control. Basically the political issue flows from an attitude toward large scale economic organization in this society, to large institutions, and whether they can be trusted or not.

You will notice, for example, that many antinuclear stories say "you cannot trust the nuclear industry" or "you cannot trust the utilities." Basically what they are talking about is a global attitude about institutions in our society: The larger they are, the less they can be trusted. That theme grown tremendously in our society over the last two decades. It was tied in with the protests of the Vietnam war. As soon as the war wound down you saw that "movement" shift directly to antinuclear concerns.

That political thread of mistrust of "the big guys" can be traced throughout the history of the United States. It is an old thread in the political fabric in this country, and for that matter throughout the world. One of the things that concerns me about its emergence in the nuclear area is that it capitalizes on and legitimizes a preexisting irrational fear in the American public. Much of the "envi-

ronmental movement" is based on this same theme of mistrust of all institutions—especially large institutions.

One European environmentalist said to me, "Don't take away our fear of nuclear power, because that is our political leverage in the whole energy field." When you ask the political activists if they think, for example, that oil- or coal-fired electric plants are somehow more democratic or more environmentally benign than nuclear power, they admit that fossil fuels are worse from these perspectives but they do not have the political leverage to do anything about fossil fuel generation of electricity. So they have jumped on nuclear power, because of the irrational fear, and exploited this fear for an essentially political purpose.

I have suggested to some of my activist friends that it would be more candid if they would come out and say what they mean, namely, that they do not want large scale economic organization under any circumstances. While this political agenda is important and legitimate, I strongly object to the exploitation of irrational public fear for political purposes.

Mr. WINN. I think you make a very good point there, and I will yield my time. I think I have gone past my time.

Mrs. BOUQUARD. Thank you very much, Mr. Winn. We could go on and on here. This is certainly very valuable testimony.

I made a statement right after Three Mile Island. I was condemned by the President for making the statement, but I felt very strongly about it, that if we had a central spokesperson, whether it be DOE or NRC to report what was going on at Three Mile Island, that a lot of our fears and a lot of the concern could have been alleviated.

Instead, we had people coming from every source, whether they were knowledgeable or whether they were not. Also, everybody became an authority on nuclear power and what was going on at Three Mile Island.

Would you care to comment on your analysis of this?

Mr. THEBERGE. I think a central spokesperson would have been helpful. But on the other hand, when you have hundreds of reporters searching for a story to get air time, they are going to find other means of comment on the situation, whether it is self-appointed experts on nuclear power or whether it is people in the industry.

I don't know of any way in our society that we could create a single spokesman and limit reporters to that one source.

Mrs. BOUQUARD. How can the press know who to believe when there are opposing viewpoints?

Mr. THEBERGE. I think that is one of the reasons the media have to develop some independent knowledge about the risks and the benefits of nuclear power, some independent means of assessing it.

I know in certain circles, particularly in television, that type of expertise is considered unacceptable—the best reporter is thought to be the one who knows the least about any given story, because then he brings no bias to it.

To me, that seems incredibly strange, but nevertheless, I have heard it articulated by very serious and well-meaning journalists.

To my mind, any complicated issue, whether it is economic or nuclear energy, requires a fundamental knowledge on the part of

the interpreter to be able to simply separate the nonsense from the facts. So again I get back to the need for more information, more knowledge than less.

Mrs. BOUQUARD. We have noted that nuclear power, because of the fear of the unknown, has been the subject of so much national news coverage. I was wondering how it would be perceived if we had a 15- or a 10-minute segment on a nightly news program on what might happen without nuclear power; what might happen without this very important source of energy that we have to have if we are truly to meet our energy commitments?

Dr. DUPONT. That is one effective way to put this in perspective: To think about what the alternatives would be. More coal-fired plants, and more oil-burning plants are the most likely alternatives to nuclear power.

My interest in the nuclear power debate as a physician interested in public health rather than someone interested primarily in the economic or technological aspects of this, is in the health area. I would like to see much more perspective given to health risks in our society, so that people could have a more realistic way of assessing their major health risks.

If you are concerned about cancer, if you are concerned about birth defects, if you are concerned about the health of the youth of our population, what should you focus on?

Where does radiation fit into those concerns as a health problem? Then, within the radiation area where does nuclear power fit into that concern?

Looking at it this way, what you find does not make very exciting news. But it is literally a matter of life and death for million of people to have the facts, because then and only then can they focus on realistic health promotion activities. A lot of very personal decisions then can be rationally made and they can make a big difference—a life and death difference.

The fact of the matter is that radiation in the United States today is a tiny contributor to ill health. Of all the radiation that Americans are exposed to, about half comes from entirely natural sources, about 45 percent is from medical X-rays, and the remaining 5 percent is from all other man-made sources including nuclear powerplants.

Less than 1 percent of that, total radiation exposure has anything to do with nuclear power. In terms of health nuclear power is not a problem and yet the public perceives that radiation is one of their main health threats. That is tragic. The media contributes to that distruction. Even though health perspective stories are not interesting to the press they are vitally important.

It is one thing to talk about conspiracies as if somehow there was a political or some other conspiracy causing this problem. I don't think there is a conspiracy. What happens is simpler; the media is caught up in the dynamics of irrational risk assessment based on the easily understandable principles I have outlined.

As Mr. Theberge says, they have to have an audience. They have to have interest. This seduces the media into areas where there is fear and where there is controversy. Their economics and our public psychology produce this result, not a conspiracy.

I was recently working with one American utility company on their plan for a possible emergency at their nuclear powerplant. They developed a brochure that explained that this particular powerplant had never had an accident that required any protective action from the public. Neither has any other American commercial nuclear powerplant, as a matter of fact. The brochure had other basic facts about radiation. The reaction of the test sample of the public in that area to the brochure was to disbelieve the brochure. Why didn't they believe it?

They said, "This can't be true. We know the plant is dangerous. We know it is a terrible threat to have that plant here, and if you tell us these things, then we don't believe you."

So the utility, if you can believe this, considered changing their report it eliminate the reassurance and perspective and to confirm the public irrational fears in order to establish their credibility.

Mrs. BOUQUARD. That is incredible.

Thank you very much, gentlemen, for your excellent testimony. I am certainly very much appreciative of your time and efforts to be with us this morning.

We look forward to hearing from you in the future.

Mr. THEBERGE. Thank you very much, Madam Chairman.

Mrs. BOUQUARD. Our next witnesses are from the Department of Energy. We are looking forward to hearing from Mr. Robert Odle, Assistant Secretary for Congressional, Intergovernmental and Public Affairs and Dr. Shelby Brewer, Assistant Secretary for Nuclear Energy.

STATEMENTS OF ROBERT C. ODLE, JR., ASSISTANT SECRETARY FOR CONGRESSIONAL, INTERGOVERNMENTAL AND PUBLIC AFFAIRS, DEPARTMENT OF ENERGY; AND DR. SHELBY BREWER, ASSISTANT SECRETARY FOR NUCLEAR ENERGY, DEPARTMENT OF ENERGY

Mrs. BOUQUARD. We are very happy to have these gentlemen with us today. Dr. Brewer, welcome to our hearings, and Mr. Odle, if you are ready, you may proceed.

STATEMENT OF ROBERT C. ODLE, JR.

Mr. ODLE. Thank you, Madam Chairman and members of the Subcommittee, my name is Robert C. Odle, Jr. I'm Assistant Secretary for Congressional, Intergovernmental, and Public Affairs.

In my testimony today, I will use the term "public information" in its broad sense to encompass those activities often designated as public affairs, consumer affairs, and education.

Public information in the Department of Energy has two functions: To help carry out energy policy through the dissemination of information; and to feed information back to the Department to assist in ongoing formulation of policy.

Such activities are mandated by the DOE Organization Act and the Energy Reorganization Act.

We are concerned today with the way those functions have been carried out since DOE was formed, and with revising the public information program to properly and equitably fulfill those functions in the future.

Specifically, our concern is with the balance or imbalance of public information support for the various energy technologies.

If there is one point I want to make today, it is that we regard our mission as presenting fair, balanced, factual information on all sources of energy.

We do not want to promote nuclear power at the expense of conservation. Our Nation no longer has that luxury of choice. We need it all.

Secretary Edwards observed recently that he saw a bumper sticker saying, "Split wood, not atoms." He suspects the driver of the car had never split wood. He believes, and President Reagan believes, we must do it all—split wood, split atoms, and everything in between.

Our public information programs need to be balanced in order to reflect that philosophy.

We found a serious inbalance when we arrived. The charts to my left will illustrate that. We are undertaking to correct that imbalance, not by tilting toward nuclear, but once again, by attempting to provide fair, balanced, and factual information on all forms of energy.

My testimony first will trace key points in the development of national energy policy under the previous administration. Next it will highlight the public information activities that were conducted under that policy, drawing conclusions about the degree of support for small-scale, renewable energy technologies, and the bias we think we found when we came in January.

Lastly, I want to define the President's energy policies and describe our intention to support that policy again with a balanced information program.

Energy policy in the previous administration, as stated in the National Energy Plan of April 1977, was directed toward conservation and fuel efficiency, rational pricing and production policies, substitution of abundant energy resources for those in short supply, and development of nonconventional technologies.

That Administration's stated objective was to reduce the importation of foreign oil and vulnerability to fuel supply interruptions.

The cornerstone of the plan was conservation and fuel efficiency.

In May of 1979, the Second National Energy Plan was submitted to Congress. This plan included an additional emphasis on conservation and the development of renewable energy technologies.

The goals for nuclear, by contrast, were modest. The administration proposed to work toward resolving nuclear waste management issues and streamlining licensing procedures so that light-water reactors could meet an increasing share of electrical energy needs.

Virtually nothing was done to inform the public of these goals.

I would like to cite for you some of the major public information programs used by the past administration to support energy policy before the present administration took office.

As you are well aware, such programs are called by many different names. For the sake of clarity, we can divide them into four categories.

The first and most expensive category was the establishment of new institutions and new offices, either wholly or substantially for the purpose of disseminating information.

Among these was the Energy Extension Service, which became a nationwide program in 1980. In that one year, according to the annual report to the Congress last May, its information or outreach budget was $25 million.

That has now been reduced to $9.6 million.

Another costly institution was the set of four regional solar centers, for which information dissemination was a major function. The outreach budgets for these four totaled $37,900,000 for the years 1979 through 1981.

Other institutions included:

The National Solar Heating and Cooling Information Center, funded by DOE through the Department of Housing and Urban Development, budgeted at $5 million in 1981.

The Solar Energy Research Institute, located in Golden, Colo., which received $2,200,000 in 3 years earmarked specifically for information activities.

The President's Clearinghouse for Community Energy Efficiency, $1 million for 1981.

The second category was publications and films. By 1979, 54 percent of all publications dealt with conservation or alternative energy sources, and only 17 percent dealt with nuclear subjects.

By 1981, the nuclear share dropped to 15 percent, and conservation and alternatives climbed to 62 percent.

In audiovisuals, the trend is even more pronounced. In the 1979 film catalog, slightly more than 50 percent of the subjects were nuclear, reflecting the strong carryover from the Atomic Energy Commission.

In the 1981 catalog, nuclear dropped to just over 10 percent. Conversely, alternative energy sources and conservation accounted for 6 percent of the titles in 1979 and 31 percent in 1981.

The third category was the public information campaign, used to promote a specific objective. Here are some examples:

The Appliance Label Consumer Education Program, $1 million in 2 years.

Fuel oil Conservation Marketing Program, a paid advertising campaign that cost $7,040,000 in 2 years.

The Low/Cost, No/Cost campaign to promote home energy conservation, $2,900,000 in 2 years.

The Office of Commercialization (or marketing) within the DOE Conservation Office, $3,700,000 for 2 years.

The information portion of the Residential Conservation Service Program, $2,500,000 in 1980 alone.

The Driver Awareness Program, an estimated $830,000 in 2 years.

The New Car Fuel Economy Information Program, more than $1 million each year.

The Solar Market Development Programs, $18,500,000 for 2 years—much of which is included in the figures for the regional solar centers.

And now I come to the fourth category, Consumer Affairs—no stranger to this subcommittee since your report of December 1980 focused attention on that office's performance.

In essence, this office aligned itself solidly with a limited portion of the public, namely those advocating small and decentralized energy sources.

Just from reading the titles of the list of grants submitted to this subcommittee, it is easy to see the thrust of the kinds of advocacy in which that office was engaged.

It awarded some 89 grants clearly intended to promote small-scale, decentralized technologies and only two to centralized.

The grants covered motion pictures, publications, posters, fairs, workshops, and other means of speaking to the public on behalf of one segment of DOE's programs.

I would like, if I might for a minute, point out some of the things we found when we arrived in DOE in the Office of Consumer Affairs.

I do not mean to suggest everything I will show you was funded totally by Consumer Affairs' dollars, but in large measures, they were.

These are some of the bumper stickers that the Consumer Affairs and Public Affairs Office were busy putting out. No problem with any of them, but see if we find anything promoting the use of centralized forms of energy or nuclear.

Just very quickly, let me show you some of the posters that I found we had spent a great deal of money on.

This, I think, is a representative sample of what the DOE Office of Consumer Affairs, the DOE Office of Public Affairs spent several hundred thousand dollars on during the four years of the Department.

This, I think, says it all, and this was paid for out of DOE funds. Here we have a nuclear reactor that is closed for repairs.

Over here we have a nuclear reactor that is polluting the atmosphere. Here we have an oil pipeline through the White House and into the Pentagon, a 15-day supply of petroleum from the Strategic Petroleum Reserve, and basically everything you look at on this chart—I guess you would call it that—depicts centralized sources of power generation as either down or polluting or there is basically something wrong with most of it, and then over here we look at all of the solar renewable efforts.

Here we have a solar-powered public address system, and over here we have Dinosaur Motors closed for repairs, and on and on and on, we see the solar, the renewable resources depicted in a very optimistic way, and all of the others depicted in a way very differently, and I really think that that chart in microcosm represents what we found when we started.

Mrs. BOUQUARD. These renewable sources, according to the testimony that I have heard, can provide less than 5 percent of our total energy needs by the year 2000, is that correct?

Mr. ODLE. Yes, ma'am. I don't know exactly the number, but I would suggest——

Mrs. BOUQUARD. By the year 2000?

Mr. ODLE. Yes, there was a real effort to convince the citizenry that they could provide a lot more than they are really capable of providing, and the picture as to the prognosis for solar and renewable was less than accurate, as we look at some of these materials.

These examples I have given are representative of the larger programs in the four categories of public information. Many include contracts or subcontracts with advertising and public relations firms. Many, many more could have been listed.

In our May 1981 annual report to the Congress, we itemized information programs for conservation and renewable energy that totaled $200 million for 1980 alone.

With President Reagan's election to office, energy policy made a rapid about-face. Nuclear energy ceased to be a "choice of last resort," price controls were removed from petroleum, and the free market rather than government regulation became the dominant feature of energy policy.

As stated by Secretary Edwards, "The overriding concern of the Federal Government is to establish sound policies that will encourage both the private and public sectors to produce and use energy resources wisely and efficiently. Reliable energy supplies are essential to restoring economic growth in the decade ahead."

To support President Reagan's new free-market approach to energy, immediate changes were ordered in the Department's public information programs. Advertising contracts were cancelled.

A moratorium was placed on the production of publications and films until all existing materials and plans could be reviewed for need, and many were eliminated. These and other related actions produced a savings of more than $8 million. Future informational activities will be reviewed by the Public Affairs Director, who reports to me.

We have taken a series of steps to gain control of our information dissemination programs, and they are now in one central office.

The point I would like to make in summing up is the point I tried to make at the beginning. Our department will not be engaged in programs or campaigns that advocate one energy technology over another.

Marketing will be done in the marketplace, and not through the Department of Energy. Where there is a need for factual information, then the Department of Energy will attempt to provide that information.

If you measure it by that standard, we need more nuclear information.

The President has announced a policy supporting the increased use of nuclear energy. It is essential that we help the public understand our policies and programs, and the reasons therefor.

Failure to do so would be irresponsible. We believe that a nuclear energy public information program intended to facilitate such understanding is a proper expenditure of public funds.

Such a program would be part of a larger, balanced DOE effort to better inform the American public of energy issues. This policy is stated in the national energy policy plan, which we submitted to the Congress this summer.

It said,

> Increased reliance on market decisions offers a continuing national referendum which is a far better means of charting the Nation's energy path than stubborn reliance on government dictates or a combination of subsidies and regulations.

Our new, nonadvocacy information programs will provide balanced, fair, and factual information that both assists in and responds to that "continuing national referendum." The funds available to us, wisely reduced from previous levels, will be sufficient for the task.

Madam Chairman, Mr. Winn, that concludes my formal testimony. I think Dr. Brewer is ready and then we will be happy to respond to your questions.

[The prepared statement of Mr. Odle follows:]

STATEMENT OF
ROBERT C. ODLE, JR.
ASSISTANT SECRETARY FOR CONGRESSIONAL,
INTERGOVERNMENTAL AND PUBLIC AFFAIRS
U.S. DEPARTMENT OF ENERGY
BEFORE THE
SUBCOMMITTEE ON ENERGY RESEARCH AND
PRODUCTION OF THE COMMITTEE ON
SCIENCE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES
December 15, 1981

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Another costly institution was the set of four regional solar centers, for which information dissemination was a major function. The "outreach" budgets for these four totaled $37,900,000 for the years 1979 through 1981.

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As stated by Secretary Edwards, "The overriding concern of the Federal Government is to establish sound policies that will encourage both the private and public sectors to produce and use energy resources wisely and efficiently. Reliable energy supplies are essential to restoring economic growth in the decade ahead."

To support President Reagan's new free-market energy policy, immediate changes were ordered in the Department's public information programs. Advertising contracts were cancelled.

A moratorium was placed on the production of publications and films until all existing materials and plans could be reviewed for need, and many were eliminated. These and other related actions produced a savings of more than $8 million. Future informational activities will be reviewed by the Public Affairs Director, who reports to me.

We have taken a series of steps to gain control of our information dissemination programs, and they are now in one central office. The Department will not be engaged in programs or campaigns that advocate one energy technology over another. Marketing will be done in the marketplace, and not through the Department of Energy. Where there is a legitimate need for factual information, then the Department of Energy will attempt to provide that information. On this basis we do see a need for nuclear information.

The President has announced a policy supporting the increased use of nuclear energy. It is essential that we help the public understand our policies and programs, and the reasons therefor. Failure to do so would be irresponsible. We believe that a nuclear energy public information program intended to facilitate such understanding is a proper expenditure of public funds. Such a program would be part of a larger, balanced DOE effort to better inform the American public of energy issues.

As the person responsible for the conduct of public information programs by the Department of Energy--including the office of Consumer Affairs--I promise you that we will conduct a balanced program that speaks to the nation's most urgent needs because it will accurately and adequately reflect the policies of the President and of the Congress. Those policies are perhaps best summed up by a single sentence in the National Energy Policy Plan: "Increased reliance on market decisions offers a continuing national referendum which is a far better means of charting the Nation's energy path than stubborn reliance on government dictates or a combination of subsidies and regulations." Our new, non-advocacy information programs will provide balanced, fair, and factual information that both assists in and responds to that "continuing national referendum." The funds available to us, wisely reduced from previous levels, will be sufficient for the task.

Madam Chairman, this concludes my formal testimony. I am available to answer any question that you or members of the subcommittee may have.

Mrs. BOUQUARD. Thank you, Mr. Odle. I appreciate your testimony.

Dr. Brewer, you may proceed.

STATEMENT OF DR. SHELBY T. BREWER

Dr. BREWER. Madam Chairman, I have a rather lengthy statement to offer for the record and I propose that I not read it and instead make a few simple points.

Mrs. BOUQUARD. Please proceed.

Without objection, your complete testimony will be made a part of the record.

Dr. BREWER. Thank you. The first point I would like to make, Madam Chairman, is that the American public does not understand energy in general. It does not understand what it is, how important it is, where it comes from, how it gets to the ultimate point of application, and the public least of all understands nuclear energy, the most contentious energy source despite its excellent safety record.

In my opinion, Madam Chairman, the quality of nuclear debate is grossly deficient. For example, a recent poll showed that 52 percent of those surveyed believed that reactors can explode like nuclear weapons. That of course is false and physically impossible. In another poll many people identified acid rain as being a nuclear problem, when we all know that it is a fossil-energy problem.

In yet another poll, about 44 percent of those surveyed did not know, Madam Chairman, that nuclear energy can generate electricity. Now that is deplorable.

These examples show a level of public comprehension that is a result of gross misunderstandings and confusion. We have done a deplorable job in recent years of communicating with the public.

Let me point out that nuclear power is a major energy supplier now—this day. About 12 percent of our electrical needs are supplied by nuclear energy. By 1990 we expect that figure to be about 20 percent. About $130 billion have been invested by the private sector in nuclear energy, about $12 billion by the Federal sector.

Furthermore, Federal programs which I manage and am responsible for in the Department of Energy involve transactions of several billion dollars a year. With this degree of presence of nuclear power in American life, the public requires, the public needs more factual explanation than they are now getting.

Considering the state of public misunderstanding of nuclear energy, and the reality of nuclear energy in American life in the energy mix, you may ask am I going to implement a public information program? Of course I am going to implement a public information program. It would be irresponsible to do otherwise.

Furthermore, we have a statutory responsibility to do so under the DOE organizing legislation of 1977.

Madam Chairman, the public information program that I have in mind is not one that would sell nuclear power to the exclusion of other energy options. Market forces, as Mr. Odle has said, and public perception will ultimately determine the role of energy in the supply mix. The modest and conventional program that we have in mind, Madam Chairman, would be aimed at achieving at

least a minimum necessary public understanding of this complex subject.

I will not use this program as a vehicle for social or political engineering.

A balanced factual, objective information program is needed. It is a cliche, but it is nonetheless true, that rational judgments by the public—exercised through their marketplace preferences—must rest on factual objective information. The public does not have factual objective information at this time about nuclear power.

As Mr. Odle has indicated, there has been a lack of balance and objectivity in the past. Yes, it is true that prior to 1975 nuclear power enjoyed a favored status with the Federal Government. Since 1977 the tilt has been the other way.

This concludes my testimony, Madam Chairman, but I cannot resist bringing to the committee's attention an example of the sort of daily fare that the public is subjected to. Last Friday, December 11, there appeared in the Los Angeles Times an article which contained the following quote:

> Utilities with nuclear power plants are storing millions of gallons of high level radioactive waste in pools near these plants.

That is false, and it is frightening to tell the people that. We do not store high level waste near nuclear power stations in liquid form.

Another quote from the article: "Nuclear power produces only 4 percent of this Nation's electricity."

That, too, is false. The figure is between 11 and 12 percent.

This concludes my formal statement, Madam Chairman, and Mr. Odle and I would be happy to answer your questions at this time.

[The prepared statement of Dr. Brewer follows:]

STATEMENT OF SHELBY T. BREWER
ASSISTANT SECRETARY FOR NUCLEAR ENERGY
BEFORE THE
SUBCOMMITTEE ON ENERGY RESEARCH AND PRODUCTION
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
DECEMBER 15, 1981

Madam Chairman, Members of the Subcommittee, I am pleased to participate in this hearing to examine the impact of the nuclear debate on public policy decisions. This is an area of investigation that is eminently germane to the present condition and future prospects of the nuclear option. In my opinion, the quality of the debate over nuclear energy has been severely deficient. The ultimate judges of the debate--the American people--are not receiving the kind of factual material that is conducive to an accurate understanding of the issues and to sensible and thoughtful judgments. The Federal Government can and should encourage a more balanced forum for consideration of nuclear matters.

At the outset, I believe it would be useful to review the events and circumstances that determined the character of the debate. During the World War II days of the Manhattan Project, all nuclear energy research and development was necessarily conducted under the shroud of complete secrecy. Unfortunately, the mindset that directed the national security operations of that wartime period persisted long after the requirement for such secrecy had passed, even into the age of commercial application. People outside the circle of nuclear scientists came to believe that nuclear energy was impossible to understand and, because of its early military applications, a dangerous and threatening technology. Many of the myths that plague nuclear energy to this day had their genesis in that era.

Nuclear technologists themselves must shoulder part of the blame for public misconceptions regarding nuclear power. Their preoccupation with exploring and extending the applications of their achievement generally precluded communication with the public. With few exceptions, we nuclear technologists

have not been adept at the art of public relations. In relinquishing our roles as nuclear spokesmen, we have done the entire nuclear community and, indeed, the Nation a grave disservice. The time is long overdue for nuclear scientists to come down from their ivory towers and communicate with the people--or to use the earlier term, the judges of the debate. The old-fashioned attitude that called for faith, not comprehension, has not been appropriate for some time.

A long standing principle of Government in this country is that Federal agencies have a responsibility to keep the public accurately informed about their programs and activities. The Congress has recognized this principle on many occasions and considered it of sufficient importance to incorporate it specifically in the Department of Energy Organization Act. The Act lists among the purposes of the Department, "disseminating information resulting from programs, including disseminating information on the commercial feasibility and use of energy from fossil, nuclear, solar, geothermal, and other energy technologies."

In the previous Administration, these responsibilities were carried out extensively in regard to conservation and renewable energy sources. In fiscal year 1979, the Department spent about $140 million for education, extension, and information programs in these areas. In fiscal year 1980, the expenditures totaled $200 million. Mr. Odle has described for you in some detail the nature of these expenditures.

In contrast there has been no comparable public information program for the centralized technologies--most particularly nuclear energy--in the past five years. In fact, as was substantiated in a December 1980 report by this Subcommittee, a sizable amount of nuclear public information material was destroyed in 1977 as a reflection of the previous Administration's nuclear policy. The

inadequate representation of nuclear energy in what should be a balanced public information program on all energy alternatives cannot be allowed to continue.

The effect of inadequate public information about nuclear energy is reflected in public opinion polls. For example, one poll indicates that 52 percent of the responders had the impression that nuclear generating stations can explode like a nuclear bomb.[1/] In another poll, there were as many people who identified acid rain as a problem connected with nuclear energy as there were who correctly identified it as a problem associated with the use of fossil fuels.[2/] Still another poll showed that 44 percent of those questioned did not know that nuclear energy can be used to generate electricity.[3/]

Such misinformation graphically illustrates the need for a drastic change in our public information practices. If the people are to participate in decisions regarding our energy future--and I believe they should--they need and deserve better information. To fail to provide the tools for informed and rational decisions is a gross neglect of our duties as public servants.

Factual information should be available on the contribution nuclear energy can make toward meeting the energy needs of this country, how its costs and benefits compare with those of other energy sources, and what the Federal Government is doing to overcome specific nuclear problems, such as waste management. We need unemotional comparisons of the merits of all energy sources based on factual, objective information. The Federal Government has a responsibility to assure the availability of such information.

1/ Roper and Cantril, 1980
2/ Lou Harris, May 1981
3/ George Del Coigne, IAEA, "Nuclear Safety," November 1979

The nuclear public information program that we have under consideration will be part of a balanced, integrated Departmental effort to provide information on energy alternatives. It will supply the general public with basic explanations of nuclear-related concerns as well as information about Federal nuclear energy policies and programs.

We plan also, as an element of the nuclear public information endeavor, to improve our communication with State and local governments. Another activity will be to improve communications with utilities and the financial community regarding our work on regulatory reform, our safety and waste management programs, and our technology development programs. Since important choices regarding energy alternatives are made by utilities and are influenced by the views of the financial community, these groups are important recipients of our information program.

We believe that effective information programs are a two-way process. We intend to listen as well as speak. The public, State and local governments, and utilities and financial institutions all have views that we need to understand and take into account. On matters of national consequence, the Federal Government has a responsibility to study alternative courses of action and to inform the public of its findings and recommendations. In a democracy we also have a responsibility to listen and to accommodate widely held public views. The dialogue that will result from our public information program will help us to fulfill that responsibility.

Although I am not prepared to provide details at this time, our preliminary considerations indicate that an effective public information program can be implemented at a cost well within the limits imposed by the current budgetary constraints.

My foregoing remarks have pertained to public education and the need for clear, accurate, unbiased information. Now I would like to say a few words about the dilemma facing the concerned but nontechnical members of the public who are searching for an unbiased assessment of nuclear energy. The confusion they must feel in response to conflicting statements by "experts" on both sides of the nuclear debate is indeed understandable. While I do not question the integrity or the sincerity of many of those who are opposed to nuclear energy, I would urge responsible citizens to consider where the preponderance of scientific and authoritative opinion lies. I would further advise the careful evaluation of what the absence of the nuclear energy alternative would mean to our economy and to our national security.

President Reagan's Nuclear Policy Statement of October 8 clearly aligns this Administration with the belief in the need for safe nuclear energy. It also initiates actions that would address the impediments currently obstructing nuclear expansion. Thirty-two leading American scientists, including eight Nobel Laureates, have strongly endorsed the President's nuclear policy initiatives. In a telegram sent to the White House, they said, "We feel that the approach that you have outlined will help to ensure the viability of commercial nuclear power as a vital component in the future energy mix of this country and that the policy is consistent with our interests in pursuing international nonproliferation goals." Madam Chairman, I would also recognize your own unceasing efforts and those of numerous other members of Congress in support of nuclear energy goals. With regard to my personal position, I am pleased to be on the same side of the debate with such distinquished nuclear proponents.

Complicating the confusion caused by conflicting viewpoints of experts is the unfortunate tendency of the news media to give non-scientific, highly vocal nuclear protestors far more space and prominence than the scientists and statisticians that represent the mainstream of scientific thought. This imbalance brings to mind an admonition from Edmund Burke, the British writer and philosopher: "Because half-a-dozen grasshoppers under a fern make the field ring with their importunate chink, whilst thousands of great cattle repose beneath the shadows of the British oak, chew the cud and are silent, pray do not imagine that those who make the noise are the only inhabitants in the field."

As a personal resolve, I am determined to become a more vocal "inhabitant of the field." As Assistant Secretary for Nuclear Energy, I pledge my best efforts to provide the kind of effective, factual public information program that I believe will engender public support. It has been my experience that the more people understand about nuclear energy, the more they favor it.

Madam Chairman, this completes my prepared statement. I would be happy to answer any questions you might have at this time.

Mrs. BOUQUARD. Dr. Brewer, Mr. Winn has a question.

Mr. WINN. I want to ask you a question what do you do about the statement in the New York Times?

Dr. BREWER. The Los Angeles Times?

Mr. WINN. Yes.

Dr. BREWER. I am preparing a letter to the editor, Mr. Winn.

Mr. WINN. If you want some cosigners, let us know.

Dr. BREWER. Thank you.

Mrs. BOUQUARD. I am pleased to hear that the Department is moving ahead to provide a balanced information program. As you know, when the last administration took office, it ordered the destruction of nuclear information pamphlets.

I think this was an intolerable situation, since nuclear energy is a mainline source of energy for our country, but I want you to know I equally believe that destruction of solar or conservation pamphlets would be equally intolerable.

I think we must have factual information on all forms of energy. I think it is necessary for this country's economic security that we have a balanced energy program, which of course depends on our nuclear program and the contributions from all our sources of energy.

I am sure that you agree with me.

As I recall, the AEC and ERDA both had quite a number of booklets on nuclear power that were helpful to students, teachers and members of the public. I know that my office had several when I came into office in 1975.

Do you still distribute any of these materials or have they been updated and reprinted? What has happened to this information?

Mr. ODLE. Madam Chairman, I think you raise a very important point.

The Office of Public Inquiries in the Department of Energy is that part of the Department that citizens write to for information. There is an office in the Forrestal Building where one can walk in, or if one calls, that is where one gets information on sources of energy.

I asked my staff the other day to take a look at what was available, and so they went into this office and pulled 46 publications on renewable and fossil programs off of the shelves, 19 on conservation, and 5 on nuclear.

That is it. That is what the citizen who writes or telephones DOE gets if he wants information on nuclear programs, so I submit that we have a long way to go, not a tilt toward nuclear but just to restore some semblance of balance, because we have got 5 publications here on nuclear, 46 on renewable and fossil and 19 on conservation.

We have got a long way to go.

Mrs. BOUQUARD. I would agree with you, but do you really feel that in the past few years that DOE has been fulfilling its legal responsibility mandated by the Congress to inform the public about all forms of energy with this sort of representation in the file?

Mr. ODLE. No, I think the Department has been negligent, and beyond that you mentioned a moment ago the publications that were destroyed.

In my review of the nuclear publications, I never yet have found a nuclear publication published by the Government or by the private sector which attacks other forms of energy.

Even the strongest nuclear proponent usually says and usually writes we need this as an addition to what we have, but we find some of the other kinds of publications not only promoting conservation or solar or renewable, but actually taking on the nuclear, and I think that is a luxury that we no longer have.

I think to have a publication promoting one energy source, say solar, at the expense of nuclear, and taking on nuclear in the context of doing that, is very troublesome, and that is what we have found in some of those publications, and so I think the Department has been negligent in two areas.

One, we haven't provided enough on nuclear and, two, in some of the other publications we have attacked nuclear, and that is wrong, too.

Mrs. BOUQUARD. Would that not be deceptive?

Mr. ODLE. In my view it's certainly not sound public policy.

Mrs. BOUQUARD. According to the charts and what you prepared and presented to us here today, it seems to me that in the past the Department has avoided any information programs about nuclear power or central sources of energy, virtually to the point, would you not say, of internal censorship?

Mr. ODLE. To just provide you with another example, if one wrote in today and asked for a catalog of films that are available, one would find the Department of Energy with 35 energy films available today, 1981.

Of those, only 4 of the 35 reflect nuclear, and conservation is the balance. In 1979, 56 out of 110 films were about nuclear, reflecting the carryover from the Atomic Energy Commission, so somebody was pretty active between 1979 and 1981.

Mrs. BOUQUARD. I think I would be constrained to agree with you, Mr. Odle.

Dr. Brewer, do you believe the President's policies in implementing nuclear power, which I gather you are responsible for carrying out, can be accomplished with the current level of public understanding and attitudes on nuclear power?

Dr. BREWER. No; Mrs. Bouquard, I do not think it can be implemented without, as I said, at least providing the public with a minimum level of understanding of this very complex subject.

I have given you examples of gross misunderstandings on a major share of the public's part, and we certainly can't get there with that kind of "publi-phobic" response to this power source.

Mrs. BOUQUARD. Thank you very much.

Mr. Winn?

Mr. WINN. Thank you, Madam Chairman.

Dr. Brewer, you handed out to us a report, a fourth report to Congress, May 1981, but according to the Omnibus Budget Reconciliation Act of 1981, within 6 months of enactment of that act, "The Secretary shall transmit," and I won't read it, but in other words, you are to give us another report.

Have you got one in the works now? Are you working on one? I think it's due in February. Do you want me to read some more about what we told you to do?

Dr. BREWER. I think you are referring to what we call in the Department the "Gold Book," but could you hold it up, Mr. Winn, and I can identify it?

Mr. WINN. It's to coordinate the various programs that you mentioned in your testimony, Energy Extension Service, National Solar Heating and Cooling Information Center, Regional Solar Energy Center.

I believe it's Mr. Odle.

Mr. ODLE. Mr. Winn, I would like to, if we might, support the background on that for the record. I believe that is an interdepartmental effort that all the various Assistant Secretaries at DOE contribute to, and I would like to, if I might, see where we are and supply you as quickly as we can with a response.

Mr. WINN. Fine; that would be fine.

The last sentence says:

> Such plans shall also include a detailed description of how the information dissemination activities and services of the Department of Energy in the fields of renewable energy sources and energy conservation are being coordinated with similar or related activities and services of other Federal agencies."

You are right, but it's my understanding that that will be coming up. That report is going to be due 6 months after the enactment of this act that I referred to, so that is around February.

I am wondering if there has been work done on it.

Mr. ODLE. I am certain that there has, sir, but I don't have the background at my fingertips. I am sorry.

[The information follows:]

> The Fifth Report to Congress, "Comprehensive Program and Plan for Federal Energy Education, Extension, and Information Activities," is in the late stages of preparation. It is our intent to submit the report to the Congress by February 1982.

Mr. WINN. All right. Either one of you can answer this question.

It kind of goes along the same line that Mrs. Bouquard was following.

Testimony showed that the expenditures for public information on decentralized energy sources increased during the previous administration, between 1977 and 1980 by 360 percent. This, as you pointed out, emphasized the weakness of centralized energy sources.

At this time there was a dramatic decline in the expenditures for public information on nuclear and other centralized energy technologies.

Do you believe that this has had an impact on the public's understanding and the attitudes on our energy alternatives, and what impact?

I mean how do you ascertain the impact? You both said yes, basically.

Dr. BREWER. Well, in my case, Mr. Winn, I think several examples of gross misunderstanding of the nuclear operation have been a result of a lack of information given to the public back during the Atomic Energy Commission days and the early ERDA days. When nuclear power became a commercial activity, there was a factual public information program for nuclear energy.

That was truncated very dramatically in 1977, in the spring of 1977. We were ordered to destroy many of those publications, and

they are no longer available. As a result the public has nowhere to turn to for factual, objective, nonpropagandistic descriptions of the nuclear energy operation.

Mr. ODLE. Mr. Winn, I wouldn't suggest that the Department's inactivity or negligence in this area is responsible for the climate we find, but I think it contributed to it.

The Department of Energy does many things. Its principals give speeches, it puts out press releases, it has exhibits, it has publications, it has audio-visuals, it has books.

It does many things, and if there is a conscious effort just to either ignore the nuclear openings in all of those many facets of the Department's activities, or in some cases to discourage interest in nuclear, then it's bound to contribute to the atmosphere that we find today.

I brought along another example. These are Department of Energy press releases for fiscal year 1981, part of which, much of which was under our administration.

This is nonnuclear and this is nuclear, so you see there and in speeches and in so many other areas there has simply been inattention to the nuclear side of the equation, or in some cases actual discouragement of it, and as I say, I don't think that is responsible for the climate today totally, but I certainly think it contributed to it.

Mr. WINN. Do you have a breakdown of your inquiries? That could possibly affect the news releases. In other words, if there are more inquiries requesting information on solar heating and cooling, for instance.

Mr. ODLE. We can supply that for the record, and I suspect that may be accurate.

Mr. WINN. I would think so.

Mr. ODLE. Yes.

Mr. WINN. Because there are not going to be too many people writing in saying, "I am interested in building a nuclear powerplant."

Mr. ODLE. No; but on the other hand I think most of the public inquiries we get in the mail or on the telephone or the walk-in traffic that we have basically says give me what you have got on energy. I want a little bit on everything.

Mr. WINN. In general?

Mr. ODLE. Yes; kids in school, that sort of thing. I suspect that is what that survey would show.

Mr. WINN. Have you ever run a survey on that? I think the committee would be very interested in at least a spot check, not an exact detailed thing, but to give us an idea of what kinds of inquiries you are getting.

Mr. ODLE. We will do that.

Mr. WINN. It would be very interesting.

Mr. ODLE. We will.

[The information follows:]

A spot check of the telephone, mail, and walk-in inquiries to the Public Inquiries Branch of the Office of Public Affairs during November and the first two weeks of December 1981 shows the following percentages: general, or all-subject, inquiries, 55 percent; conservation, 10 percent; nuclear, 10 percent; solar, 7 percent; other renewable, 5 percent; coal, 4 percent; petroleum, 4 percent; and other, 5 percent.

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Mr. WINN. In a recent survey of public attitudes on nuclear issues, only an insignificant minority correctly identified living next to an operating nuclear powerplant as a smaller source of radiation than, one, a cross-country flight in a jet airplane; two, living in the State of Colorado for 1 year, I guess that is because of the altitude; three, the medical and dental examinations, X-rays of a typical person during 1 year and, four, living in a brick building for 1 year.

How do you offset that, or what can you do to correct this kind of public misinformation?

Mr. ODLE. Once again I think at least in the Department of Energy one thing you can do is talk about it, and when Secretary Edwards gives speeches, and he does frequently as any member of the Cabinet does, he talks about energy.

He talks about some of those facts that you just mentioned, sir. Our press releases try to describe a little more. We are in the process of trying to come up with some decent balanced publications on energy that will make some of those points.

Mr. WINN. Yes; but if Secretary Edwards books an auditorium and he is going to give a speech on energy, there are not going to be very many people go.

I don't mean to downgrade Secretary Edwards. He is a good friend of mine, but the constructive, interested person is not there for some reason or another. It's hard for us to perceive that, but even when he comes up to brief the Members of Congress who are voting on legislation affecting the DOE, our attendance is not very good, but if you book an auditorium and you get a movie star or somebody in that category to criticize nuclear powerplants, why you fill the place, and then you get about 10 times as much news coverage as Secretary Edwards would get on his.

Mr. ODLE. I couldn't agree more, and just as I don't think the previous Department was responsible for the climate, but did contribute to it, nor is it possible for us in our time here to totally change it, but we have got to try. We have got to use those resources that we have, whether it's press releases or speeches or publications.

Mr. WINN. A combination?

Mr. ODLE. Yes; we have to use all the tools that we have, and we are not kidding ourselves. We are not going to change that climate, but we can contribute to perhaps changing it, not so that everyone ends up being an advocate for nuclear——

Mr. WINN. No.

Mr. ODLE [continuing]. At the expense of something else.

Mr. WINN. I was going to ask do you have a film or a movie, because, for instance, cable television is doing a pretty big job in the field of education. They are always looking for shows to use. They are even using some of the Members of Congress once in a while.

My point is that they are looking for news, and if you have a film that shows not only nuclear power advantages but all the rest of it, solar, conservation, and everything, if you have a very objective film, I think you could get some good mileage out of it.

Mr. ODLE. Let me tell you what we found when we came to the Department.

We found that $422,000 a year was being spent on distribution of audio-visuals on conservation and renewables and $15,000 on nuclear.

Mr. WINN. So you get back to the imbalance——

Mr. ODLE. Yes, sir.

Mr. WINN [continuing]. That you talked about to start with.

Mr. ODLE. We have to correct that.

Mr. WINN. I might add just as a constructive idea; it's not original, but I have done it and so many of the other Members of Congress who have television shows. You have a film of that type, and it would give us the opportunity to hook on for educational purposes. Of course we get some political advantage out of it too, an introduction and a signoff. I think you would get some additional mileage out of the original expenditure on that film.

Mr. ODLE. That is a good suggestion; yes, sir.

Mr. WINN. Thank you.

I had better quit right there, Madam Chairman.

Mrs. BOUQUARD. Thank you, Mr. Winn.

Mr. Odle, how long do you think it's going to take us to get some of our publications back in circulation on central station power and nuclear energy?

Mr. ODLE. We are working on a couple now between Dr. Brewer's office and my own trying to get two on line and get them out and get them into circulation. We are in the process of doing that currently.

Mrs. BOUQUARD. I am very anxious to see some of the material when it's published.

I do want to thank both of you, Dr. Brewer and Mr. Odle, for giving some very valuable insight into what DOE is going to do about our public information programs.

Thank you both for being here.

Are there further statements?

I want to compliment you for charting what I think will be a sensible course toward a fair and balanced public information program. This Committee will continue to monitor your progress toward implementing it, especially during the coming fiscal year 1983 budget process.

I would hope that you would follow through with the program goals that you have outlined today. Certainly you have identified an existing situation that is crying for correction.

Again, our thanks to you and to our other fine witnesses that have appeared.

We will have a short recess. We will break for lunch and come back at 1:30.

We have one final witness, Mr. Gene Pokorny, who is president of Cambridge Reports, Inc. He will be with us at 1:30 this afternoon.

So until 1:30 the Committee is in recess.

AFTERNOON SESSION

Mrs. BOUQUARD. The Subcommittee will come to order.

We will resume our hearings on nuclear public information and rational public policy decisions. We have been fortunate to have very informative and knowledgeable witnesses. Our next and last witness is Mr. Gene Pokorny, President, Cambridge Reports, Inc. Mr. Pokorny, we welcome you to our Subcommittee. We look forward to your testimony.

STATEMENT OF GENE POKORNY, PRESIDENT, CAMBRIDGE REPORTS, INC.

Mr. POKORNY. Thank you, Madam Chairman. It is a pleasure being with you today at this hearing on the energy debate that is taking place in this country.

My name is Gene Pokorny, president of a company in Cambridge, Mass. called Cambridge Reports. We are a survey research firm which over the last 8 years has done approximately 1,700 surveys both in this country and abroad on a wide range of topics. Specifically with regard to the topic of this hearing we have done numerous studies over these last 8 years on the subject of nuclear power development.

My intent here this afternoon is to make just a few points that are responsive to the questions you raised in your original letter of November 6 when you invited me to appear at this hearing. I apologize for not having any written remarks, but as I had told Harlan when he called me about 2 weeks ago, I have been on the road for the last 2 weeks.

Mrs. BOUQUARD. That is quite all right. We are happy to have you here. We look forward to hearing from you.

Mr. POKORNY. My remarks are really in three categories. In particular I would like to discuss the way the public deals with risk. Let me first, however, confirm what I think you have probably heard already in this hearing, that the public today is significantly confused about the issue of nuclear power and, more broadly, is also confused and has low levels of information about many aspects of the overall energy situation.

Let me illustrate with just a few points. I have already gone over some of the testimony that was given this morning, and so I have seen that you already have some examples of this. In a recent national survey, for example, that we conducted of the adult American population, we found that only 25 percent of the American public, literally only one out of four of us, knows that we import between 25 and 33 percent of our daily oil needs. Right at 30 percent of the American people tell us in this survey that they have no idea how much oil we import.

Let me give you another example. When I asked a national sample of the American adult population recently to tell me what will be the major source of total power to the American economy in the year 2000, not electricity generation but total power to the American economy in the year 2000, right at 35 percent of the people tell us that solar power will provide the largest single amount of total power to the U.S. economy.

Furthermore, pursuing the topic of solar power, let me share with you this piece of data that comes out of a very recent national survey. We asked a sample of the American adult population

whether or not they thought that solar power would generate baseload electricity by the end of the 1980's—that is a technical term which I am sure you are familiar with, Madam Chairman, in terms of the utility industry, baseload electricity generating capacity—and 60 percent of the American people said that kind of generating capacity would be provided by solar by the end of this decade.

Let me switch to the topic of nuclear power to illustrate a few points there that illustrate this lack of understanding. In the nuclear area, today in the country, right at half the American people believe that a nuclear reactor can explode in a mushroom cloud-like way. On the subject of nuclear waste, if I ask the American people to tell me if they are concerned with that subject, to no one's surprise the American people say they are very concerned with the subject of nuclear waste disposal and management. But then in an open-ended question when I ask what is it that bothers you about nuclear waste and get them to verbalize in their own words what is behind their fears, their concerns, virtually no one uses the word radiation as the cause of the problem or the cause of the fear.

Now let me mention one other point, on the subject of synfuels—a new technology which the country is developing with regard to energy production. Today in the country the majority of the American people believe that synfuels will cost less to produce than traditional hydrocarbons, and they also believe that they will be less damaging to the environment overall than traditional development of hydrocarbons.

All right, let me underline a point here at the end of these few pieces of data. I do not want to be misunderstood by pointing out these pieces of data. I am not trying to say the American people are ignorant, or are not trying to make good judgments. I do not want to see these data interpreted in a cynical or a disparaging fashion. After having done 1,700 surveys over the last 8 years I have more respect for the American people, not less, in terms of the way they are trying to struggle with complicated decisions and come up with right or correct preferences from their point of view.

The point I am underlining though is that in the area of energy education or energy information, particularly nuclear, there are just massive gaps in the public's factual understanding.

Leaving that aside, let me now make a few comments on the heart of the material I would like to share with you this afternoon. These are some thoughts on how the public thinks about nuclear risk or to state that another way, how it analyzes risk. These comments will be somewhat generic. They relate not only to how the public deals with nuclear risk, but how it deals more broadly with all questions of technological risk. A couple points.

First, the public thinks about risk differently than do scientists and engineers. Scientists and engineers tend to look at risks and benefits independently, calculate a value for each, and then after doing that put them together and try to decide whether the risks outweigh the benefits or vice versa.

The simple point is that the public does not deal with it that way. When the public thinks of risks, it is always affected by the perceptions of benefits. In other words, in the public's mind, they

are always considered together. Therefore, perceived benefits always influence perceived risks.

What that means as you go forward in talking about energy education or nuclear education is that one cannot talk to the public about risks in a vacuum. You might be able to talk in that way to scientists and engineers, but when you are dealing with the public, risks always need to be combined in the discussion with benefits, because if that is not done overtly, it will be done by the public anyway in their own mind.

The second related point I would make in this area of risk analysis is that the public is always willing to accept more risks if it perceives greater benefits. That flows from my first point. Also, and very importantly, the public is always willing to accept higher risks from an activity which it perceives it voluntarily chooses to participate in, as opposed to an activity that it perceives is thrust upon it involuntarily. The classic example of that is people willing to smoke and incur certain risks, yet unwilling to incur the risks from a high technology like nuclear power.

The third point very simply is that on the basis of our research, it appears that the human cognitive system is better able to deal with high-probability, low-risk events as opposed to low-probability, high-risk events. What I am saying is that smoking, for example, or driving a car without seat belts, is a classic example of a high-probability, low-risk event, whereas one's concern about nuclear power, chemical waste management, any of these much more complicated subjects is an example of a low-probability, high-risk event, and whether we like it or not, it seems that the human mind, on the basis of the way it has evolved through its evolution, which is essentially a process of trial-and-error learning, the mind is much more able to deal with these high-probability, low-risk events. Therefore, to put a bottom line on this, it is hard for most people to think rationally about low-probability, high-consequence events.

The fourth and final comment I would make in this area is that it is also clear from our data, when you look at the way the public deals with risks, that all of us, as average citizens, live our lives using some mental rules of thumb. That is, there are certain ways our mind processes information and tries to make complicated subjects simpler. This is just a natural human tendency. Some of these mental rules of thumb that are worth thinking about as you deal with this very difficult question of public education would be the following:

There is what some researchers have called an "availability bias" in the human mind. That is to say, we view events as more likely if we can recall them in our mind's eye. I noticed some of your earlier witnesses talked about the impact of television. Television as a technology of information dissemination has been very good at giving people symbols or visual stimuli that can be easily recalled. Anything that can be recalled tends to be processed mentally by people more easily.

Going back to the history of the nuclear debate, and I know that some of your witnesses referred to this this morning, given where nuclear came from historically and the "availability bias" of people to remember the mushroom cloud, this helps explain why they fear the risk of nuclear power. There is an "availability bias" to remem-

ber the visual images of a nuclear bomb explosion and be afraid of it.

In this same vein, big accidents are feared as a result of this bias much more than single, regular, small-scale accidents; that is, more people fear a crash of a DC–10 because of the media coverage of the DC–10 that crashed a few years ago in Chicago than fear individual car accidents where people are killed alone every day, one at a time.

The other comment I would make is that there is a "certainty bias." We all tend to think we know more than we do, and we particularly think with the wisdom of hindsight that we knew more in the past than we really did. Therefore, what that allows us to do, as a public, when new information comes out, for example on a subject like nuclear waste management, is make very harsh judgment on past policymakers and decisionmakers, after the fact, believing that we knew more than we did. This bias is the way our mind seems to work.

The last comment I would make in this area is that there is a theory in psychology which you may be familiar with called cognitive dissonance. Simply stated, it means attitudes once held are hard to change. For example, a simple attitude, do I favor or oppose nuclear power, once held tends to distort the rational processing of new information. That may sound complex, but it is a very simple concept.

What it means to those of you trying to deal with the difficult topic of public education is that once a debate becomes polarized, and I know you have used that word in this hearing so far today, there is less ability to move and educate the public than if one could give education and information when the debate was less polarized.

In an ironic kind of way, the more people think they know, the more knowledgeable they think they are, and the harder it is to educate or to impart new information. Thus, nuclear power in a way may be an issue that is somewhat behind us. It is water over the dam, if you will, but other issues that you will be considering in the future will travel along this same path. Therefore the implication of this is that the sooner we can educate the public to deal with these complicated subjects, the better off the policy process will be and the public's interfacing with that public policy process.

In conclusion, let me say that to the extent that one of your goals here is to help develop policies with regard to public education, there is absolutely no question in my opinion that that needs to be done.

First, as some of my earlier data points showed, there is an enormous need for just basic factual information in this country about the level of America's energy needs, its problems, its potential solutions, and what the good and the bad aspects of all of those are. But more importantly, beyond just factual information, there is an enormous need for education on how to cope with the subject of risk, education, on risk assessment.

This education, must take into account the way the human mind deals with the subject of risk. We can't ignore some of the things I have said here in terms of the way we know the mind works.

If we do, then we will be ineffective in our education.

In a sense we must educate ourselves on how to cope with our intuitive biases, and overcome them as we try to arrive at rational judgments.

It seems to me that in a democratic society there really is no option to educating people to deal with these complicated subjects. If we don't, then we move further in the direction of having elites make decisions for the society with lower and lower levels of broad public participation.

At any rate, as you see, Madam Chairman, I have gone over a good deal of territory here. I appreciate the opportunity to make these comments to you this afternoon, and I would be happy to answer any questions at this time, if you have any.

Mrs. BOUQUARD. I think you have answered most of the questions I had for you, Mr. Pokorny. You did a beautiful job. It seems we have got a lot of catching up to do.

I certainly appreciate this assessment.

You stated that no one mentioned radiation when they verbalized their concern about nuclear waste. What fears or concerns did they express?

Mr. POKORNY. When you ask people what bothers them about nuclear waste, what they will say to you are things like "it's dangerous," "it's unsafe," or "I'm afraid of it."

The point I am making is that they articulate fear, but they don't per se use the word "radiation" as the cause of the fear.

If I may comment a little more on that. In a questionnaire if I say, "How concerned are you about nuclear waste?" I get very high levels of concern. If I then say, "How concerned are you about the subject of radiation?" I get significantly lower levels of concern. The pieces don't seem to have been put together that radiation is the cause of the fear.

In other words, people are handling them as separate, discreet subjects.

Mrs. BOUQUARD. Where does the public currently get its information about nuclear energy?

Mr. POKORNY. On the basis of our surveys we firmly believe that the major source of information to the American public on not only nuclear questions but in a sense virtually all complicated public policy questions, is television, television news. Virtually every time we ask that question on a national sample we find about two-thirds of the American people tell us that television is their primary source. It is in that 60 to 70 percent range almost inevitably.

Mrs. BOUQUARD. Dr. DuPont stated this morning that public education will be helpful in the long run, but we could expect negative reaction in the short term.

Would you care to comment on that?

Mr. POKORNY. I am not sure I understand what he meant by negative reaction.

Mrs. BOUQUARD. First of all, because of the phobia that some people have with respect to nuclear energy, to try to educate them in the short run makes the fear worse, but in the long run, after they have lived with it awhile, they learn to have greater acceptance.

For instance, consider a person with a phobia of getting on an elevator. The first time that they decide they are going to cope

with it and they get in the elevator they are terribly frightened, but as they proceed to get on the elevator more and more, they will overcome some of the anxiety.

Mr. POKORNY. I am sure that is true for those people for whom their antinuclear feelings are essentially phobic, and he knows far more about that subject than I do.

I would say, however, that there probably are a lot of people who aren't that far along on the spectrum of fear. Therefore, with those kind of people, in the short run, you might with greater public education not have that immediate short-term negative impact before you get the long-term positive.

Mrs. BOUQUARD. Who do you think the people want to hear from on issues that are as important as energy and nuclear power? Don't you think they have the right to expect the expertise and the policymakers of the Government to provide this information for them?

Mr. POKORNY. We have asked people over the years in surveys whom they look to for this kind of information, and what seems to come through all of that data, that questioning, is that the public wants information on these kinds of questions from people that they perceive to be experts, and also people they perceive to not have a self-interest.

As a result of that, any institution or individual person who scores on both those dimensions will be perceived as a credible spokesperson.

The Government, Government spokespeople, and Government agencies often in the public's mind do score high on both of these dimensions.

They are perceived to know what they are talking about, and they are perceived not to have a self-interest in the sense that a private sector profitmaking organization would have, so that there is in the mind of the public a desire to get information from the Government.

Mrs. BOUQUARD. From the Federal Government?

Mr. POKORNY. Well, from all agencies of government, including the Federal, but it is true for all levels of government.

In a State like New Mexico where there has been a controversy, as I am sure you are well aware, about the siting of a nuclear waste repository there is a strong need on the part of the public to have more information, and they would value in that case both information from the State and the Federal Government.

In that particular case they might even value information from the State a little more than from the Federal Government because of some things the Federal Government has done or that they perceive it has done. But clearly, there is a role for Federal involvement. The public tells us that.

Mrs. BOUQUARD. If you were to ask the public the same questions about big business in general, industry or oil companies or chemical companies—would the answers be different than they are regarding the nuclear industry?

Are these attitudes part of a general trend against big business and big industry?

Mr. POKORNY. Let me answer that this way: We have done a great deal of research in the area of chemical waste management

and chemical waste disposal. Some of the comments I made in my second cluster of remarks about the way the public deals with risk, apply whether it is nuclear risk or chemical risk or the risk of other technologies. It is the same generically, the way they process that information is the same.

To the extent that there is a big business aspect to it, any time the public perceives big business on one side of an argument, many people will tend to go the other way.

That is one of the problems with so much of the complicated debate that is taking place in this country, not just on nuclear. I talked about that in my remarks, that the public simplifies when it gets too complicated.

Mrs. BOUQUARD. It is all black and white.

Mr. POKORNY. They use, if you will, mental constructs, good guys and bad guys and big business becomes kind of a symbol that they use to simplify much of the debate and then they react against it.

Sometimes big government can become that same kind of symbol too. However, if you are saying is there an anti-big-business dimension to the antinuclear debate in America, yes, but I don't think that is the dominant dynamic that is out there on that issue.

Mrs. BOUQUARD. Do you think that much of the public's apprehension actually can be traced back to Hiroshima and our worries about nuclear war rather than specific risks associated with the production of nuclear power?

Where does the initial perception come from?

Mr. POKORNY. There is absolutely no question that the historical development of nuclear energy, having come from the military's usage before it, moved into commercial power generation usage, has an impact on the way many people in the public still deal with the subject, and it is a negative impact.

In a way, with the wisdom of hindsight, it would be nice if there was another word for commercial nuclear power other than commercial nuclear power.

If the weapons program could be called nuclear weapons and commercial power could be called atomic energy, and if you could just do that and separate that out, getting into the world of symbols, that probably would be an advantageous thing to do and allow the public to deal with the military application of the technology with one set of words, and commercial usage of nuclear energy with another set of words, but that is all hypothetical. We are beyond that.

Mrs. BOUQUARD. Perhaps another way to do this would be to examine nuclear power within the framework of all sources of energy that we are going to look to. For instance, this is what nuclear power is going to do, this is what solar can supply, this is what fossil energy can supply, and so on, and really put them in proper perspective.

Mr. POKORNY. Absolutely.

Mrs. BOUQUARD. This could go a long way to alleviating some of the misapprehensions and seeing atomic energy in a different role.

Mr. POKORNY. Absolutely. That relates to the comments I was making that you cannot deal with perceived risk outside of dealing also with perceived benefit.

One of the things we say to people that we have consulted with who have tried to do some public education on nuclear subjects is that you cannot deal, with the subject of risk alone.

There is absolutely no reason why a rational person would ever incur any risk, even if it is a risk of 1 in 10 million, if there was no need to.

It doesn't make any sense from just a commonsense rational basis. None of us incur risks unless we perceive there is a compensating benefit, and we don't incur the risk rationally unless we think we get more benefit than we incur risk, so that one of the mistakes of those who have often tried to educate the public on nuclear subjects is that they have always talked about risk in a vacuum.

You have seen those reams of public education material, films and brochures that talk about compare the probability of having an accident from living next to a nuclear powerplant to the probability of being hit by a car when you step off a street curb.

In our opinion that kind of educational or informational activity is counterproductive, because the public doesn't deal with the risks that way.

That is, the way a scientist deals with it, where you weigh the risks and the one that is lower you say is preferable. People don't deal with it that way. If you don't get people to see that there is an energy problem facing the country, what a risk this creates, what the options are to displace imported oil, the role of solar, et cetera, you are going to have misinformed judgments, about not only nuclear but synfuels, and coal development.

I might say to you, Madam Chairman, that we are just beginning to do a significant amount of work in the coal area, and we are seeing there some of the same developments taking place with regard to public opinion, public attitudes, and public preferences as we saw 8 years ago when the nuclear debate started moving into the public eye.

Mrs. BOUQUARD. That is very interesting.

Mr. POKORNY. So that anything you can do to help shed light on how to educate on nuclear will be very helpful on other subjects as they come along.

Mrs. BOUQUARD. As Chairman of this Subcommittee, I have tried always to stress that I think we have got to have a proper balance; that nuclear energy, indeed, has a role to play, but at the same time we can't turn away from other sources and rely solely on nuclear. Every one of our energy resources needs to be developed as rapidly as possible, and we still need to conserve. We still have some catching up to do.

Mr. POKORNY. As a citizen I would totally agree with that.

Mrs. BOUQUARD. Mrs. Freiwald said you have interviewed skydivers, and the risks and benefits associated with it.

Mr. POKORNY. Different people have different equations in their heads as to what risks they are willing to incur for what benefit. Again, the great irony is skydivers who will be on a picket line against a high technology project of any sort.

But the point I am making, is that they are not misdirected. It is too simple to look at it that way. We have to understand the way

the mind works, or it seems to me we don't help alleviate the problem.

Mrs. BOUQUARD. Your testimony has been very helpful.

Are there any questions?

Thank you very much for being with us today, and if we should have questions that I can submit to you in writing, will you respond?

Mr. POKORNY. I would be delighted.

Mrs. BOUQUARD. I would like to apologize to you today for the small attendance. As you know, we are trying to wind up this session of Congress, and there are many activities going on at this time. It was not a lack of interest, but there are many demands on our schedule today. Thank you very much for being with us today.

Mr. POKORNY. Thank you.

Mrs. BOUQUARD. The Subcommittee is adjourned.

[Whereupon, at 2:15 p.m., the Subcommittee was adjourned.]

APPENDIX I

Additional Statements Submitted for the Record

Testimony by H. A. Bethe for Committee on Energy Research and Production

My name is Hans A. Bethe. I have been Professor of Physics at Cornell University since 1935, and I am now Professor Emeritus. I am an active consultant to the Los Alamos National Laboratory and to the Avco Everett Research Laboratory, Everett, Massachusetts. I also consult for two other national laboratories.

I am chairman of AFEI, Americans for Energy Independence, and a member of the steering committee of SE2, Scientists and Engineers for Secure Energy. Both of these organizations are devoted to the idea that the U.S. make sure it maintains an adequate supply of energy of all types.

On my own, I have spoken and written on the subject of adequate energy supply for over 8 years. Nuclear energy must be part of this energy supply. Specifically, I have done the following:

1) I have published an article in Scientific American in January 1976 on "The Necessity of Nuclear Power". I have also written other articles on energy in general.
2) I have spoken to college audiences which generally include a majority of students with an anti-nuclear bias. I give them a straight-forward talk, recognizing the problems and meeting questions head on.
3) More rarely, I have talked to industrial audiences which is easy since they are mostly sympathetic.
4) I have participated in three debates with prominent anti-nuclear persons. I do not believe that debates are very useful because both speakers are apt to drift away from the main subject. At the last debate, in a small college of the New York University system,

I afterwards received a letter from one of my supporters saying "Everybody agrees that you won the debate, but very few persons changed their mind."

In my discussions I have noted that there is much misinformation on nuclear power. This is not surprising in view of the large number of anti-nuclear books available in bookstores, not matched by pro-nuclear books. There is great need for better factual, public information on nuclear power.

It also appears to me that the media are biased against nuclear power. Every small mistake in a nuclear plant gets a big spread in the media, as also does every slight release of radioactivity, even if it cannot possibly have noticeable effects on the health of people. For instance, the New York Times, one of the most level-headed papers, had in 1979 about 200 articles about radioactivity, all stressing its dangers, while there were only 25 mentions of asphyxiation and suffocation. The latter causes claimed 4,500 victims, whereas no person was injured by radioactivity from nuclear power.

The electronic media, television and radio, are more strongly anti-nuclear than the press, including an unwillingness to correct factual mistakes in their shows.

It is difficult to counter the anti-nuclear propaganda. The Mobil Company tried to do so by running ads in favor of various types of energy, including nuclear. Yet a colleague of mine who is pro-nuclear was much annoyed by these ads which he considered as self-serving. Industry has a

bad name. Perhaps my colleague would respond to an educational campaign by the government. However, in many circles the credibility of the government is also rather low.

Advantages of Nuclear Power

A government educational campaign might start from some of the advantages of nuclear power which seem to have been forgotten in the debate. They include the following.

1) Small weight of fuel. 30 tons of fuel will last for a year while 3 million tons of coal are needed for producing the same amount of electricity. This means that a nuclear plant needs fuel only once a year which can be delivered at a convenient time while coal- or oil-fired electric plants need massive deliveries every day. In severe weather, such deliveries are apt to be interrupted while nuclear plants will continue operating.

2) The small weight of the fuel makes transportation much cheaper as well as easier and reduces the probability of transportation accidents. It also reduces the number of mining accidents. Finally, the volume of waste from nuclear plants is much smaller than that from coal-fired plants.

3) Nuclear fuel is a practically inexhaustible energy source. Once the breeder or a similar type of reactor is in place, the uranium in the U.S. will last for tens of thousands of years, at an affordable price. Together with uranium from sea-water, this time can be further expanded. By contrast even coal will last only a few hundred years. An inexhaustible energy source is as good as a renewable one.

4) Uranium avoids the buildup of CO_2 in the atmosphere. While the use of coal at a moderate rate appears to be environmentally permissible, greatly increased use my easily lead to the greenhouse effect, with severe changes of climate.

Discussion of Arguments Against Nuclear Power

The usual arguments against Nuclear Power must be addressed, put in perspective and refuted where possible.

1) Safety of Nuclear Plants: Here one can point to the record, including the fact that at Three-Mile Island only very small amounts of radioactivity were released to the public, in spite of many mistakes made during the accident. The Rasmussen report can be used for quantitative estimates, with appropriate reservations. It is important to emphasize the quality of the building and that a melt-down would not by itself mean a major hazard to the public. Only a melt-down followed by a breach of the containment building would release an appreciable amount of radioactivity, and such an event is extremely unlikely. It should also be stated that nobody with any knowledge of the subject ever said that nuclear accidents are impossible; the anti-nuclear groups have claimed that government and industry had made such statements.

Improvement of safety can only come by operating nuclear plants and gaining experience. Even accidents such as Three-Mile Island are useful in this respect; they teach us what safety features need to be improved.

It is important that the government continues research on safety of nuclear power, with undiminished financial support. Otherwise a government information campaign on nuclear power will not be credible. Supervision of plans and operation of nuclear power plants by the NRC must continue undiminished. The NSOC (Nuclear Safety Oversight Committee) has recommended that the NRC be relieved of many obligations which are not safety-related, such as investigating the need for power at a particular location, and that these tasks be assigned to the power commissions of the states. This would leave the NRC free to concentrate on safety problems, and at the same time could accelerate the licensing process. This recommendation by the NSOC should be implemented; unfortunately, the NSOC itself has been disbanded.

Safety of nuclear power plants is of special interest to the nuclear industry. Here too the Three-Mile Island accident has taught a lesson: the industry suffered enormous losses. As a consequence the industry established INPO, the Institute for Nuclear Power Operation; NSAC, the Nuclear Safety Analysis Council, and a scheme of mutual insurance of utilities against losses from accidents. INPO amounts to a self-policing of the nuclear industry which is very much to be welcomed.

2) The public information must include the results of the BEIR, the Committee of the National Academy of Sciences on the biological effects of ionizing radiation which includes some of the best

experts on radiation in biology and medicine. They concluded that the effects of very low levels of radiation (less than 10 rem at one time, or less than 1 rem per year) are very small and very difficult to observe. They examined statements by certain researchers who claimed to find substantial effects, and found these statements to be without merit. The findings of the BEIR group are partly based on evidence from the survivors of Hiroshima and Nagasaki which completely confirms the BEIR statements.

3) There is need to educate the public to think quantitatively. Nothing in life is free of risk, but the risk from nuclear power is extremely small. Both the probability and the consequences of an accident have to be considered. Anti-nuclear speakers and writers like to quote the estimated results of the worst possible accident, without telling you that even if large numbers of nuclear power plants had existed throughout the history of man, such an accident would probably never have occurred.

4) The economics of nuclear power is still very good. In this country, on the average, nuclear power from power stations is estimated to be some 10 or 20% cheaper than power from coal, its only serious competitor. In Europe and Japan, power from coal is about 50% more expensive than nuclear power. Therefore, there is a strong incentive for these other countries to use nuclear power, whether we use it or not. This goes especially for those countries which do not have any coal themselves.

5) Proliferation: It is important to stress the difference between nuclear power and nuclear weapons. The diversion of nuclear fuel in other countries from power production to weapons is controlled by the IAEA, the International Atomic Energy Agency. This Agency should be strengthened and given more financial support. However, our aim of preventing proliferation of nuclear weapons is greatly disturbed by the recent rumor that the U.S. government may use plutonium from spent reactor fuel elements for the manufacture of weapons. This should not be done, we should keep nuclear power and weapons cleanly separate. Moreover, it should be made very clear that if use of plutonium from commercial reactors in weapons is ever contemplated it would require isotope separation of plutonium which is a rather hazardous process requiring very high technology.

6) Waste disposal is the biggest question mark in the minds of many members of the public. Definite plans must be made as soon as possible to dispose of the commercial high level nuclear waste. This must include not only a definite technical plan, but also political discussions between the federal government and those states in which waste disposal is contemplated. The waste, as well as the public concern about it, must be laid to rest.

To summarize, I believe that a well thought-out, completely honest information campaign on nuclear power by the Federal Government is very necessary and in fact overdue. Such a campaign was successfully undertaken by the French Government a few years ago.

TESTIMONY OF DR. ALLEN BRODSKY

BEFORE THE

SUBCOMMITTEE ON ENERGY RESEARCH AND PRODUCTION

HEARING ON

NUCLEAR PUBLIC INFORMATION AND RATIONAL PUBLIC POLICY DECISIONS

I am presenting this evidence to the Committee as a private citizen, not as a representative of any past or present employer. Specifically, I am a private citizen who happens to have worked with Dr. Mancuso as a co-investigator when I was a professor at the University of Pittsburgh, and who worked with and taught with Dr. Ernest Sternglass in the Department of Radiation Health. My testimony is concerned with personal knowledge and investigations that largely precede my present employment.

The purpose of this testimony is to provide some personal experiences and factual information about gross distortions of fact as well as scientific opinion presented to the public about the risks of radiation and nuclear power. My greatest concern is that the distortion of important information presented to the voting public may be organized and deliberate. For brevity, I will cite only a few examples with references that the subcommittee may examine further to check details and develop further understanding.

My first example of the biases I have observed in public information the past several years begins with my testimony before the House Subcommittee on Health and the Environment, February 9, 1978, and the subsequent questions and answers, which are a matter of public record. My testimony against the claims of Drs. Mancuso, Stewart and Kneale (hereinafter referred to as MSK) that they found radiation-caused cancers at Hanford was supported by numerous, common-sense, simple, examples - both written and verbal. Congressman Tim Lee Carter congratulated me on my testimony and responses to questions; yet, today I realize that my testimony was practically to no avail.

I noticed during my testimony and that of others who opposed the Mancuso/Stewart claims that the TV camera lights were off. Further experience with the TV media as well as with the newspaper media in the weeks following the '78 hearings have made it obvious to me that the public is getting primarily one side of the picture. In fact, the side of the picture they are getting, if anyone cares to take time to read the actual literature on the subject, will be found in a side of the picture espoused by a minority of scientists who are not at all among those who are respected as contributing importantly in the fields of radiobiology and human health effects.

For brevity, I will simply present below some paragraphs from my refutations of the MSK claims and methodologies, as well as the article by Dr. Sternglass after Three Mile Island (TMI) that used my name and refutations of his claims.

From the testimony of Dr. Allen Brodsky before the House Subcommittee on Health and the Environment, February 8-9, 1978.

> "As a final example of the absurdities of the Mancuso-Stewart-Kneale paper, let me merely quote the following paragraph from my January 12 memorandum[4]:
>
> "Furthermore, note that the authors coin a terminology 'high risk' year to denote any year where the average radiation dose to members of the cancer death group is even slightly greater than that of the non-cancer group. First of all, they are confusing dose with risk (or response). Second, they are presuming what they are trying to prove. Third, to show how preposterous and unscientific this is, note that for all years in Table 5, the averages to be compared (for 1944-57) are merely 199 millirem* per year for the cancer-death group, and 187 millirem per year for the non-cancer deaths; for 1958-72, the respective averages are 513 versus 477 millirem per year. (The authors do not state whether their averaging calculation was weighted by the number of employees alive each year.) Considering that each year an employee must receive (a variable) 100-150 mrem per year from natural background radiation (including natural activity in his body), as well as the (again variable) 39 millirem per year average from diagnostic medical exposures as cited earlier[10] (which as everyone knows can vary for an individual from 0 if he did not have an X-ray that year up to many hundreds of millirem), then comparison of the average doses in Table 5 makes it clear that they are effectively the same between cancer deaths and non-cancer deaths; i.e., known other types of exposure, including occupational exposures at other facilities than Hanford,[13] could obviously obscure such small differences in average occupational exposure at Hanford between the cancer and non-cancer groups, if they had been reported. Dr. Mancuso had also on many previous occasions emphasized that conclusions regarding radiation effects could never be drawn without examining possible effects of chemical agents in the work environment.[13] Chemical agents are not even mentioned in the present paper.[13]"

The above paragraphs represent only one of many in which absurdities of the MSK approach have been been pointed out in my own memoranda and articles and those of others. The most recent rejection of the MSK claims appears in an article by S. C. Darby and J. A. Reissland, "Low Levels of Ionizing Radiation and Cancer - Are We Underestimating the Risk?", Journal of the Royal Statistical Society, Vol. 144, Part 3, pp. 298-331, 1981, and problems that need to be resolved with epidemiologic methodology are covered in the discussion published with this paper. Some statistical problems with the MSK approach, and the results of a preliminary study of Hanford mortality by a longitudinal analysis, are given in a paper that I had published, titled "A Statistical Method for Testing Epidemiological Results as Applied to the Hanford Worker Population," HEALTH PHYSICS 36, 611-628, 1979.

Despite the rejections of the MSK methods, the publicity given to their so-called "findings" of radiation-caused cancers at Hanford has given much of the public, as well as scientific community not directly involved in these epidemiological studies, a grossly distorted impression of the risks of radiation at the levels at which the workers and the public are presently exposed. Even recently, I attended a meeting of the American Association for the Advancement of Science in Washington, D.C., where an entire panel discussion was dominated by scientists representing extreme opinions, including Drs. Stewart and Kneale. This kind of distortion of scientific truth and respected scientific opinion in a democracy where people vote is an extremely dangerous trend, in my opinion.

Since, unfortunately, testimonies of myself and others refuting Mancuso, Stewart, and Kneale in 1978 have not received the repeated publicity, I have extracted below some important recommendations made before Senator Hart's Subcommittee on Nuclear Regulation, Committee on Environment and Public Works, April 10, 1978, which are still pertinent today.

"RECOMMENDATIONS

In order to focus attention on some main requirements for resolving the present controversy and confusion over the health effects of radiation, I am condensing below my general recommendations recently made before the Rogers' subcommittee. Implementing these recommendations at NRC for the case of radiation would also provide models for dealing with other environmental agents in other agencies, and problems of health assessment in general.

1. An independent national group of eminent scientists and health professionals is needed to quality control test results of radiation health studies, and provide direct guidance and judgments to Congress as well as the Administration. This does not have to be a large group, nor should it interfere with the independence and replication of investigations by others. However, this matter requires the support of appropriate legislation and the implementation by a broad group of health professionals and scientists cognizant of all the areas of data collection and statistical analysis involved. ... One of the early functions of such a group should be to establish a set of rules, analogous in purpose to Koch's postulates in microbiology, that place certain conditions on epidemiologic studies before any claims of "proof" of scientific findings can be made. I have developed the concepts of this need in a number of the Mancuso project reports, in terms of the needs of radiation epidemiology.

2. Each agency should maintain permanent record systems of radiation exposures of those populations under its protection and should also maintain appropriate data to carry out annual health evaluations of these populations as part of its auditing programs to understand and evaluate the long-range accomplishments and/or

adequacy of its programs. This recommendation is consistent with Dr. Mancuso's often-stated principle that any health study must be carried out in conjunction with those who know the data best. Present agency programs do not begin to adequately approach this need. The costs involved will not be appreciable, nor would privacy be violated, if the programs are properly organized and supervised, and designed to incorporate currently related studies.

3. Each agency responsible for the protection of public health and safety should maintain an advisory committee or advisory staff composed of outstanding health scientists and professionals as well as those who understand the engineering methodology of controlling the agents of concern, in order to give a balanced evaluation of programs and policies of that agency as they affect the health and mortality of populations under their protection."

One more set of exhibits that I would like to record is the following sample news article by Ernest Sternglass which appeared after TMI in various newspaper articles around the country and made a misleading reference to my own work published in the HEALTH PHYSICS Journal in 1965. It will be seen that a reading of this article would give the impression that I supported Sternglass' contention that the government was covering up effects to citizens in the environment of the TMI accident. The numbers that Dr. Sternglass quotes from me are from the 1965 paper in which I calculated the effects of a full fission product release. A reading of my paper will show that it was to be conservative and on the safe side as a basis for designing reactors to protect against releases. In actuality there was nothing like a full fission product release at TMI. Instead, less that 1 millionth of radioactive iodines, which are among the most volatile of the radiotoxic fission products, escaped from the reactor building to the environment. I can verify this with my own personal observations. Thus, it was not the government that was lying, but rather Dr. Sternglass who was propagating what I believe is worse than a lie. It is an article that gives the appearance of being scientific, but distorts the amounts of radiation received by people by more than a factor of 1 million. Among the following exhibits are letters refuting the contentions of Dr. Sternglass, including one sent to the Pacific News Service on May 2, 1979. Soon after, eight of these articles were sent to me from around the country. Not only did I not receive an acknowledgement of my letter from either Pacific News Service or Dr. Sternglass, but they even continued to propagate this same distorted article under varying headlines for at least two months after I sent my letter to Pacific News Service. Drs. Peter Beckmann and Ralph Lapp called me in July 1979 to tell me they had seen this same article in THE PROGRESSIVE and wondered whether I really had been in support of Dr. Sternglass. I had to tell the truth about the misuse of my name. I still wonder how many millions of people have read Dr. Sternglass' article and believed it because they cannot obtain the truth by picking up the phone and calling me. Our nation must provide another way for the masses to obtain the other true side of the story even if it does not make front-page news in the media's eyes. Thus, I am asking for this opportunity to re-emphasize this matter by publishing the following exhibits as part of these hearings.

NRC covers up radiation effects

By Ernest Sternglass

(©1979 Pacific News Service)

The Harrisburg nuclear power plant accident may have exposed about a million people to up to 130 times more radiation than the government has reported. And the effects will be far more serious and long-lasting than the Nuclear Regulatory Commission (NRC) has so far acknowledged.

The NRC reported only the external gamma radiation doses received from passing clouds of radioactive gases. It failed to calculate the total and most damaging dose received by organs and bones from inhalation of fission gases. NRC's claim that pure xenon and some traces of iodine 131 were the only radioactive gases released is also misleading and unproven.

The government did not measure the precise composition of the radioactive steam that escaped into the atmosphere at the start of the Harrisburg disaster.

But there is every reason to believe that the escaped steam contained many radioactive chemicals normally produced by fission. The NRC's Dr. Allen Brodsky, an expert in the field, lists 21 such elements.

Gases inhaled from clouds of radioactive steam produce a dose about 130 times greater than that from external gamma radiation, according to Brodsky. He bases this calculation on data from earlier nuclear accidents and during nuclear bomb tests carried out in the '50s and '60s.

The NRC says that maximum accumulated doses were 80 millirems in the week following the Harrisburg accident, but true maximum doses to the lung may have been as much as 10,000 millirems. Doses to bones from elements including Strontium 89 and 90, which are decay products of the rare gas krypton, are about 30 times greater than what is absorbed by external gamma radiation.

Strontium 90 was not only released during the accident, but is also emitted during normal operations of nuclear power plants, as are cesium 137, berium 140 and larger amounts of xenon and other, chemically inert gases. Official publications of the NRC list these elements among annual radioactive releases into air and water.

Krypton and xenon are the most common radioactive fission products. The NRC has told the public the emissions contained mostly these inert gases which do not necessarily produce the greatest biological damage. However, official statements have generally failed to point out that these elements decay into more hazardous materials, including cesium, berium and strontium.

Strontium 90 has been regarded by the scientific community as the most toxic of all fission products of nuclear testing. It collects in the bones and can cause cancer and leukemia. It has a half-life of about 30 years and, like other radioactive isotopes produced in the fission process, lingers and builds up in soil. It may present a hazard in food grown near Three Mile Island.

In the past few months, however, the NRC has issued new regulations that will no longer make it necessary routinely to report the level of strontium 90 in local soil and milk.

Failure to consider strontium 90 and other decay products emitted during the Harrisburg accident is a coverup of the damage done. It is further evidence that the NRC is primarily concerned with protecting the nuclear industry.

The health hazard has also been discounted by other federal officials. Last week, Joseph A. Califáno Jr., Secretary of Health, Education and Welfare, told the Senate health subcommittee that leaked radiation was not expected to cause a single cancer death among the people living within 50 miles of the plant.

Yet even using only the external doses that the NRC has reported—2 millirems to a population of about a million within 50 miles of the plant—between 0 and 50 cancer deaths can be expected, according to Dr. Karl Z. Morgan, former director of the Oak Ridge National Laboratory's health civics division.

But if the unreported exposure from inhalation is also considered, 300 to 2,500 cancers may develop in the next ten to 20 years. Other health effects can be expected to include genetic defects and physical and mental retardation among the newborn.

Officials have repeatedly compared radiation doeses at Harrisburg to those received during dental x-rays. This is a completely deceptive attempt to minimize the exposure. A dental x-ray is confined to a couple of inches of relatively insensitive area. At Three Mile Island, the whole body is exposed. Furthermore, the dental x-ray is over in a fraction of a second while the inhalation of strontium 90 will irradiate the bone and marrow for many decades after the individual has been exposed. It will also affect an infant developing in the mother's womb, possibly years later. This is not true of dental x-rays.

The Harrisburg health hazard is far from over. There will be continued emission of radioactive gases from the plant over many months and possibly years as radioactivity is removed from the plant.

To protect the population, we should insist that all animals that produce food or milk be fed imported seed and hay until the full extent of the contamination is established. This should continue for some time while rain washes radioactive elements deeper into the soil and into rivers and ocean and diminishes the level in grass that serves as local seed.

Ernest Sternglass is a professor of radiological physics at the University of Pittsburgh School of Medicine and the author of Low Level Radiation (Ballantine).

P. O. Box 34471
W. Bethesda, Maryland 20034
April 30, 1979

Dr. Prakash N. Shrivastava
Director, Radiological Physics
Allegheny General Hospital
320 E. North Avenue
Pittsburgh, Pennsylvania 15212

Dear Prakash:

As I discussed with you by telephone on Friday, I would like to make the following response to Dr. Sternglass' comment in Pittsburgh on April 25, 1979, that the NRC-reported doses did not correspond to calculations in my paper "Criteria for Acute Exposure to Mixed Fission Product Aerosols" (Health Physics 11, pp 1017-1032, 1965), in which he claims that the "typical mix" would give 30 rem lung dose per curie sec/cubic meter and 10 rem to the thyroid compared to only .28 rem from external irradiation, quoting Table 8. These rem and thyroid doses, as well as other results of Table 8, were calculated under the assumption that a large fraction of radioiodines and other fission products were released from the hypothetical reactor. As I have stated in public on a number of occasions since the Three Mile Island accident, the containment building retained a remarkably high proportion of those radionuclides that escaped from the reactor vessel, so Dr. Sternglass is quoting results based on assumptions that are not applicable to the Three Mile Island accident. Evidence from whole-body counting of more than 700 persons shows very definitely that the amount of internal exposure from radioiodine or any other radionuclide has been negligible and could not be even one millionth of the dose calculated in my hypothetical accident. Indeed, the NRC and its predecessor regulatory agency carried out such hypothetical calculations for the very purpose of designing containment to prevent releases of the type that Dr. Sternglass believes occurred but which did not occur.

I hope that my statement will clarify the situation and alleviate concern.

Sincerely,

Allen Brodsky

Allen Brodsky, Sc.D.

P. O. Box 34471
W. Bethesda, Md 20034
May 2, 1979

Pacific News Service
604 Mission Street
San Francisco, CA 94105

Gentlemen:

This response to Dr. Shrivastava also applies to the attached article that has been distributed by your news service. I found out that Dr. Sternglass has been presenting the same information at some public meetings, so I am informing pertinent news media by this same letter. I hope you can correct the completely false impressions left with the public by Dr. Sternglass' article. If you have any questions, please call me on 301-443-5970.

Sincerely,

Allen Brodsky (mc)

Allen Brodsky, Sc.D.

Encl: Article

In further response to the distortions of Sternglass, I calculated the maximum possible equivalent dose to any member of the public in the vicinity of the Three Mile Island plant that would have occurred if all the fission products in the fuel had escaped from the reactor, flushed with the water into the containment building in the same way as the iodines, and escaped to the environment to the extent of one-millionth of the quantity present. (The assumption of one-millionth escaping would be a conservative overestimate since only one-millionth of the more volatile iodines actually escaped.) I used the same estimates of effective dose from fission product release from my 1965 paper (Health Physics, Vol. 11, pp. 1017-1032, 1965) that was misused by Sternglass in his articles, except that I assumed only one-millionth escaping. Even under these severe conditions, the TMI accident would have resulted in no more than 20 rem to any member of the public, which would not have been the catastrophic type of event so often believed possible from a nuclear power plant. My own calculations also indicate that the health risk estimates by the Government teams were not underestimates or cover-ups as publicized by Sternglass, but were conservative and on the safe side. My calculations are summarized as part of an article in the journal Health Physics, Vol. 39, pp. 9932-1000, Dec. 1980. However, I am not aware of any media attention given to any of my findings. In fact, I find in talking with members of the public that many of the distortions propagated by Sternglass are still being propagated and are responsible for much of the current public fear of nuclear power.

Conclusions:

My concern over these matters of public information has led to the following conclusions:

1. The distortions of fact and competent scientific opinion regarding the safety of nuclear power have been propagated so intensely, for so long, that only direct awareness and actions by the Congress and the President can possibly avoid further disastrous effects on the essential energy industry.

2. Measures such as those I recommended before Senator Hart's Committee to provide Congress and the agencies with the most trusted oversight and advisory groups (including a proper collection of scientists, engineers, and representatives of industry, the public and environmental groups) can provide the credibility needed to draw public attention to the legitimate assessments of our nation's top scientists.

3. Congress should seek ways of improving communications with the public regarding the results of the detailed and intensive studies carried out by the Government in regard to nuclear power and

radiation effects. It seems to me that there is a serious gap in our Federal public information programs in general, which results from some outdated ideas regarding the role of Federal institutions, including Congress and the President, in communicating with the public. I certainly do not advocate any reductions in freedom of the press. However, I find myself in a situation where my own freedom of speech is effectively limited in relation to that of my former colleagues Dr. Sternglass and Dr. Mancuso, because the mass media seem to have an affinity for their types of pronouncements.

It has occurred to me that the founding fathers of our country could not have foreseen the tremendous power of modern mass media, since the scientific means for this power did not even exist when this country was born in 1776. If Sternglass had misused my name or distorted my materials in communications with the public, I could have mounted my horse, knocked on the doors of my neighbors, and set the record straight with their assistance. The media that I have been able to reach today has probably reached no more than tens of thousands of persons in my attempts to refute--even with solid evidence--Sternglass' pronouncements that were on major TV news after TMI and many newspapers around the country, reaching tens of millions of persons. There are precedents in the medical field for State licensing of physicians, while still allowing them complete freedom and privacy in treating their patients. Perhaps Congress could get some ideas for correcting some of the problems of the competence and selectivity of the media in dealing with technical issues by an examination of standards and rules governing the health professions. Both the health and communications professions have a crucial role to play in the ultimate health and survival of our citizens.

I hope the above testimony will be helpful to this subcommittee.

APPENDIX II

ADDITIONAL MATERIALS

professional reports □

SYNDROMES OF RISK AND ENVIRONMENTAL PROTECTION: The Conflict of Individual and Societal Values

Miller B. Spangler
U.S. Nuclear Regulatory Commission

ABSTRACT. The nuclear accident at Three Mile Island on March 28, 1979 vivified the pattern of anxieties and fears associated with the term, "China Syndrome." However, even before this accident there were widespread public concerns regarding the introduction of numerous technologies and associated issues of risks to public health and safety as well as to the natural and human environment. The National Environmental Policy Act of 1969 and other laws were designed to improve the analysis and treatment of these concerns in social decision making. This article will discuss some of the identifiable patterns of individual and group attitudes—characterized as syndromes—which reflect deep divisions in our society over the desirability of technological developments, their adaptations, and implementation policies. Of special importance is the nature of conflict between the effects of such technologies on individual values as opposed to effects on the common good of society or as perceived by various groups or sub-populations. Of particular moment is how to improve equity in the distribution of beneficial and adverse effects among different interest groups in the face of traditional societal decision philosophies that emphasize the greatest good (i.e., maximum net benefit) for the greatest number.

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SYNDROMES, BIASES, AND PERSONAL DECISION PHILOSOPHIES

The Reduction of Complexity Through Syndrome Acceptance

The information explosion accompanying scientific research and countless technological innovations along with the complexity of human relations in a highly urbanized society and an inflated governmental bureaucracy have made many of us yearn for a simpler lifestyle, even though it may be beyond our immediate grasp. The normal defense mechanism for preserving our sanity in the face of information overload and the would-be stress of accepted responsibility for thinking with logical consistency about the numerous personal and societal decisions in which we share as voters, if not activists, is the acceptance of a variety of syndromes which collectively buffer and simplify our personal decision making.

For our purposes, a syndrome may be defined as "a set of concurrent concepts including related emotions and decision predispositions that form an identifiable attitudinal pattern." Although all syndromes include elements of belief and bias, not all beliefs and biases are to be viewed as syndromes. The salient differences are that, unlike some simple biases or beliefs, syndromes require a definite *emotional* commitment as to what is *good or bad* in a personal or societal sense; the biases and beliefs inherent in syndromes must form a discrete *thought pattern* regarding interrelated concepts; and the syndrome must significantly *predispose* the individual to certain types of *decisions or actions*. Viewed in this sense, syndromes should not be thought of as psychopathic (i.e., involving an emotionally or behaviorally disordered state), although in extreme form psychopathic behavior may be related to obsessions with certain syndromes.

Syndromes reflect our accepted notions of the proper way to achieve the "good life" or, alternatively, they reflect our anxieties or fears and the patterned strategies of how best to deal with them. Although we can invent our own personal syndromes, there are a large variety of off-the-shelf syndromes that have been conceived and cultured by others from which we can choose or modify to suit our own needs, values, and perceptions. As seen in Appendix A, some examples are: the "small-is-beautiful syndrome," the "almighty-dollar syndrome," the "anti-establishment syndrome," the "what's-good-for-General-Motors-is good-for-the-country syndrome," and "guilt-by-association syndrome," the "put-it-in-a-nutshell syndrome," the "Pandora's box syndrome," the "zero-risk syndrome," the "Murphy's Law syndrome"—to name just a few.

Syndromes Related to Technological Innovations and Their Impacts

Following World War II and up to the early 1960's, science and technology was looked upon with high favor in our society as the mainspring of economic and social progress and the bulwark of our national security. However, by the mid-sixties there was a growing appreciation that unintended consequences of technological developments were despoiling the natural and human environments and imposing new risks to health and safety. Disenchantment and disillusionment set in with the technological establishment and lead to a spate of new laws, institutions, and environmentalist and consumer protection groups. Lawrence Lessing (1971) described these events as "the senseless war on science." In my view, the basic failures were not those of scientists and engineers, but rather: (i) a failure in the social management of technology, especially the lack of analytical attention to forecasting the undesirable, unintended, indirect, short- and long-term consequences of technological applications, and thus to seek ways of mitigating their impact, and (ii) an unrealistic expectation that scientists and technologists can solve completely any and all problems, and eliminate all risks and uncertainties in the pushbutton style of the computer age.

Two examples of personal attitudes of these kinds, as found in Appendix A, are the "zero-risk syndrome (No. 62) and the "newness-of-risk syndrome" (No. 69). The zero-risk syndrome accepts the notions that human life is priceless and therefore all technologies should have demonstrable zero risk else social decisions to introduce them are immoral. This personal attitude, of course, ignores the technological impracticability of achieving zero risk for any and all human activities and developments including the risks of the no-action alternative to the proposed development. Moreover, it ignores resource limitations on the *societal affordability of opportunities for risk reduction* (Cohen, 1980) and the loss of potential net benefits from taking the calculated risks associated with technological innovations.

The starting point for the "newness-of-risk syndrome" is the observation that the risks and uncertainties of new technologies—especially high technologies involving system complexities—are not well understood even by the experts. Since anxieties over new kinds of technological risks are enhanced by the lack of personal knowledge as well as wide-ranging controversy by technological or scientific experts, the belief is held that applications of the technology should be postponed until it is perfected in the laboratory regarding risks to the human and natural environments. This view ignores: (i) the infeasibility of technological perfection, (ii) the vital importance to technological progress in learning-by-doing in real world settings with "hands-on" experience, and (iii) the possible loss of net benefits to society during the period of lag in technological applications by retarding their introduction.

Polarization in the Choice of Antagonistic Syndromes

It is readily observable that syndromes are often found in antagonistic pairs: (i) the "gee-whiz syndrome" (technological optimism, No. 2) vs. the "we've-gone-about-as-fur-as-we-c'n-go syndrome" (technological pessimism, No. 3), (ii) the "technological-progress-is-always-good syndrome" (No. 4) vs. the "technology-arrestment syndrome" (No. 5), (iii) the "almighty-dollar syndrome" (No. 11) vs. the "economics-don't-count syndrome" (No. 12), (iv) the "decision-by-computer syndrome" (No. 17) vs. the "distrust-of-numbers syndrome" (No. 18), (v) the "what's-good-for- Arklandfornia -is-good-for-Arklandfornia syndrome" (No. 23) vs. the "stars-and-stripes syndrome" (No. 24), (vi) the "tunnel-vision syndrome"

(No. 33) vs. the "broad-brush-thinker syndrome" (No. 34) and (vii) the "zero-risk syndrome" (No. 62) vs. the "damn-the-torpedoes syndrome" (No. 63).

Humans have a pronounced tendency to be uncomfortable with uncertainties as to which side is correct regarding technological issues or the proper way to reach decisions. As noted by Carter (1954), the mind seems to be under some pressure to reach definite decisions since the sensation of "not knowing what one thinks" is unpleasant. Thus, many persons choose up sides early in a controversial situation. The polarization of attitudes leads to the behaviorist phenomenon of "cognitive dissonance." Regarding cognitive dissonance theory, Bateson (1975) comments that human beings are rationalizing animals, actively defending themselves through distortions and denials against information that contradicts their deeply held beliefs.

As characterized in Appendix A, there are a substantial variety of syndromes (Nos. 49–61) denoting attitudinal preferences for adversarial strategies in dealing with persons having an opposing polarization. Fortunately, not all of us, of course, belong firmly to one or the other of the adversarial camps. The role of the social decision maker is to recognize the diversity of interests and values of different groups or subpopulations and to seek solutions involving equitable trade-offs, where this is practicable, between such opposing interests.[1]

SOCIETAL DECISION PHILOSOPHIES

The Greatest Good for the Greatest Number

A long-standing ethical principle in social decision making is what is referred to in Appendix A as the "greatest-good-for-the-greatest-number syndrome" (No. 30). This derives from the famous work of the English political economist, Jeremy Bentham, entitled *An Introduction to the Principles of Morals and Legislation* (1789). Bentham defined the principle of utility as "that property in any object whereby it tends to produce pleasure, good or happiness, or to prevent the happening of mischief, pain, evil or unhappiness to the party whose interest is considered." He then advocated that the object of all legislation must be the "greatest happiness of the greatest number." Because his utility definition recognizes happiness in both its positive and negative forms, the term "greatest happiness" is to be viewed as a *net* concept which accommodates costs as well as benefits.

Regarding public decisions in the choice of technological alternatives, the option with the highest ratio of total benefits to total costs would generally agree with the Benthamite principle of the greatest number only if costs and benefits are averaged over a long sequence of technological developments in which various parties take turns in being winners and losers. This is so because, for some kinds of technological projects, the greatest benefits may be primarily local or regional in nature whereas the costs, including subsidies, may be distributed over a large number of persons or taxpayers. Note that the Benthamite principle of social decision requires losing minorities to sacrifice their interests for the overall welfare of the majority interests.

The Pareto Optimality Rule

The "Pareto-optimality syndrome" (No. 31) states that technological applications are acceptable in those cases where some parties are better off and none are worse off. This principle derives from the works around the beginning of the 20th century of the Italian engineer-economist named Vilfredo Pareto. It is clear that this principle would also meet the Benthamite test of the greatest good for the greatest number since, in this case, only good for all results from the developmental activity. However, it is difficult to imagine any large developmental project in which at least some individuals or groups would not regard themselves as losers. Nevertheless, as noted above, if "social contract theory" were accepted in which individuals are willing to be losers in some actions provided this is more than compensated for over a series of developmental actions (in which other parties may, in turn, be losers), then *programmatic* Pareto optimality may result.

Another approach, called a *potential* Pareto improvement, is defined by Mishan (1973) as a change which, if costless transfer of goods and/or money among members of society is assumed, *can* make everyone better off—in other words, where it is possible for the winners out of their net benefits to adequately compensate the losers without themselves becoming losers in the process. Chauncey Starr has suggested, for example, that nearby residents of a proposed nuclear power plant might be compensated for the incremental risks they would be exposed to by offering them reduced electric rates (NRC, 1981). There are already being experienced certain local or regional benefits which may (more or less) compensate nearby residents of electric power plants and certain other technological installations for perceived risks and other environmental costs (Spangler, 1980). In this regard, regional income and employment benefits may be significant. Moreover, for lightly-populated rural counties the siting of a major facility with investment costs of hundreds of millions—or even a billion or more—dollars may provide an increase of tax revenues of two- to twenty-fold. The

[1]The term "social decision maker" as used in this paper is more inclusive than "public decision maker" in recognition of the fragmented, though interrelated, manner in which technological decisions are made in our form of political economy and representative democracy. Thus, a social decision maker could include any government or industry official, voter, consumer, or other party who consciously includes societal interests as a major consideration in personal or institutional decisions to accept or oppose a technological development.

combination of improved community services and social infrastructure made possible by the increased tax revenues together with a reduced property tax rate is a powerful stimulus to increased property values benefitting homeowners and other property holders.

Toward Achieving Equity

There are some who feel that social decisions should be made to achieve equitable distribution of costs and benefits for each developmental action even if this does not maximize net benefits for society as a whole. This is characterized in Appendix A as the "perfect-equity-now syndrome" (No. 32). Quite obviously, persons who feel this way have not subscribed to the social contract theory of willingness to accept turns in being winners and losers in a sequence of developmental actions so as to come out overall winners in such an aggregation of costs and benefits over time. No small part of the difficulty of such acceptance is a failure to perceive and appreciate the gains from a social contract theory of this kind. Moreover, the complexity of such an accounting of overall net benefits from a large number of developmental actions plus the inherent uncertainties of the relevant forecasts of desirable and undesirable effects are also detractions to be reckoned with. A mountain of faith would be required which, for some, would appear too high to hurdle.

Nevertheless, the perfect-equity-now principle, if accepted in social decision making, would pose its own set of practical problems and theoretical difficulties. First of all, there are the imposing costs of the administrative burdens of assessing in a legal framework the degree of inequity involved, an appropriate level of compensation to the would-be losers, as well as the most cost-effective mechanisms of compensation. The cost of regulatory delays in facility construction as well as the increased risk and uncertainty of future investments of these kinds must be added to the legal and administrative costs. Moreover, the adjudicating process associated with the determination of fair compensation may itself impose psychic costs and stresses on community identity and cohesion which may, in some instances, parallel in significance those accruing from the present system of uncompensated losers.

Also, in view of repeated and largely unsuccessful attempts by a number of relatively advanced societies to achieve more equitable personal incomes through income redistribution measures, one must be at least a bit skeptical about the ultimate achievability of equity in the distribution of costs and benefits associated with the introduction of technologies. Another baffling problem of the social decision maker in this regard is the known tendencies of individuals to possess an internal conflict of their own values as discussed below. Nevertheless, not to attempt to analyze the possible inequitable distribution of costs and benefits of proposed developments nor to explore mitigative options for improving on equity is to invite unnecessary and undesirable political costs through such neglect.

The Social Decision Philosophies of NEPA and Executive Order-12291

Both the National Environmental Policy Act of 1969 as amended, and the Executive Order-12291 issued on February 17, 1981, require that Federal agencies base their decisions on analyses of the beneficial and adverse effects of identifiable alternatives. However, neither of these instruments formally provide decision rules which would indicate how potential conflicts between values of the individual or minority groups and those of the common good or majority should be resolved. In fact, one does not find the word "equity" or "fairness" or other synonyms in the language of either NEPA or EO-12291. Obviously, the intent is to leave such arbitrations to the reasonable judgment of the decision makers themselves. This policy is confirmed by the Council on Environmental Quality in its discussion of "NEPA and Agency Decision Making" (Part 1505) in which a record of the implementing procedures and "major decision points" are required in case-related Environmental Impact Statements (CEQ, 1978).

Despite the absence of explicit language, both the NEPA and EO-12291 do contain structural elements and procedural requirements that are highly suggestive of decision criteria relating to equity considerations involving individuals or various parties of interest as well as the principle of serving the common good or general welfare of society at large. Regarding the latter, NEPA uses the phrases "health and welfare of man" (Sec. 2), "overall welfare and development of man" [Sec. 101a], and a "wide-sharing of life's amenities" [Sec. 101(b)(5)].

Similar, if somewhat stronger, procedural requirements to consider the interests of society as a whole are found in the following statement of general requirements of EO-12291 (President, 1981):

> Sec. 2. *General Requirements*. In promulgating new regulations, reviewing existing regulations, and developing legislative proposals concerning regulations, all agencies, to the extent permitted by law, shall adhere to the following requirements:
>
> a. Administrative decisions shall be based on adequate information concerning the need for and consequences of proposed government action;
>
> b. Regulatory action shall not be undertaken unless the potential benefits to society for the regulation outweigh the potential costs to society;
>
> c. Regulatory objectives shall be chosen to maximize the net benefits to society;
>
> d. Among alternative approaches to any given regulatory objective, the alternative involving the least net cost to society shall be chosen; and
>
> e. Agencies shall set regulatory priorities with the aim of maximizing the aggregate net benefits to society, taking into account the condition of the particular industries affected

by regulations, the condition of the national economy, and other regulatory actions contemplated for the future.

As for impact on the values of an individual from a proposed Federal action, there are a few such references in the NEPA and EO-12291. For example, the Executive Order in Sec. 4 dealing with regulatory reviews for proposed regulations, rules, or procedural changes, refers to the requirements for the agency to pay full attention to public comments in general and the comments of *persons* directly affected by the rule in particular. It should be noted that, in legal parlance, the term "person" can be interpreted as that of an individual or of another single party of interest such as a corporation, institution, or group having legal status.

On the other hand, the NEPA has several references reflecting concern with the interests of individuals as opposed to society at large. The most imposing of these is the controversial Sec. 101(c) which states:

c. The congress recognizes that each person should enjoy a healthful environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment.

This purpose is reinforced by Sec. 101(b)(2) which states:

2. Assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;

The phrase "all Americans" logically can be interpreted as "each and every American." There is, of course, the matter of whether these statements of policy are to be interpreted in the strict sense of a legal *requirement* that is designed to protect *fully* the rights of the individual or whether it is posed as a goal or ideal to be striven for in good conscience in Federal action. As a practical matter, a "one hundred percent assurance of safety" is simply not a feasibility in human existence on this planet and the denial of one proposed developmental alternative may eliminate or reduce the specific or overall risk to certain given individuals, but at the same time increase the risks for other individuals for the substitute developmental activities at possibly other locations.

Moreover, the fact that individuals commonly in their day-to-day decisions accept small incremental (statistical) risks in order to achieve the benefits associated with their actions or purchasing decisions is evidence that assurance of zero risk is scarcely conventional practice by individuals. Thus, the social decision maker is justified in considering trade-offs in the conflicting values of a given individual as well as trade-offs in net values between individuals or other parties of interest. In interpreting environmental law, the Courts have generally responded to a "rule of reason" in due process cases.

As for matters of equity regarding such trade-off considerations, neither the NEPA nor EO-12291 are very explicit. The Executive Order provides in Sec. 1(b) the definition of a "major rule" as any regulation that is likely to result in:

1. An annual effect on the economy of $100 million or more;
2. A major increase in costs or prices for consumers, individual industries, Federal, state, or local government agencies, or geographic regions; or
3. Significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets.

Here it may be seen that the first provision is a macro-level concern for the U.S. economy. However, provisions (2) and (3) recognize the importance of considering the effects of regulations on different parties of interest at least at the local and regional levels, if not the individual level. Other attention to specific parties of interest are found in the following items of Sec. 3(d) which specify information that is required in agency analysis of the effects of each proposed major rule:

1. A description of the potential benefits of the rule, including any beneficial effects that cannot be quantified in monetary terms, and the identification of those likely to bear the costs;
2. A description of the potential costs of the rule, including any adverse effects that cannot be quantified in monetary terms, and the identification of those likely to bear the costs;
3. A determination of the potential net benefits of the rule, including an evaluation of effects that cannot be quantified in monetary terms;
4. A description of alternative approaches that could substantially achieve the same regulatory goal at lower cost, together with an analysis of this potential benefit and costs and a brief explanation of the legal reasons why such alternatives, if proposed, could not be adopted.

It is observed that the specific inclusion in items (1) and (2) of potential benefits and adverse effects which cannot be quantified in monetary terms, are requirements that would facilitate trade-off considerations involving an improved level of equity. For it is clear that the non-quantitive or non-dollar effects of developmental actions covered by regulations often fall unequally on groups and sub-populations relative to those which bear the direct dollars costs or receive the direct dollar benefits.

The requirement of identifying the affected parties is also helpful in dealing with trade-off considerations involving matters of equity. In line with the above discussion of the "perfect-equity-now syndrome," it is imperative to note that nothing in the Executive Order requires the attainment of equity—an impractical task—but it does have provisions which would facilitate questions of improved equity to be examined.

As for the NEPA, its provisions include a number of phrases that imply or are suggestive of equity considerations in social decision making. These include:

1. The objective of creating and maintaining "conditions under which man and nature can exist in productive harmony" [Sec. 1(a)].
2. *To fulfill the* "social, economic, and other requirements of present and future generations of Americans" [Sec. 101(a)].
3. To achieve a "balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities" [Sec. 101(b)(5)].
4. To insure that "presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with technical considerations" [Sec. 102(b)].
5. To explore the "relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity" [Sec. 102(2)(C)(iv)].

Words or phrases like "harmony," "balance between," present and future generations," "along with," and "relationship between," are all implicative of equity considerations in social decision processes. In particular, I do not find that the equity considerations that are suggestive in the language and requirements of EO-12291 are at odds with the equity considerations suggestive in the language and requirements of NEPA. Rather, the Executive Order would appear to be fully supportive of the encompassing intent of the NEPA, but possibly with a somewhat different interpretation of relative emphases than has often been the practice in interpreting NEPA requirements.

ON THE CONFLICT OF VALUES AND THEIR RESOLUTION

The Diversity of Public Values and the Views of the Ruling Elite

With the form of political economy and representative democracy in the United States, decision making affecting social and economic values, including environmental effects, is highly fragmented. Thus, the term "ruling elite" consists of officials of industry and government, but also lobbyists and leaders of activist groups who often wield substantial influence on legislative decisions as well as those involving specific technological developments.

Given the nature of our pluralistic society with its diversity of views and values, a major point of concern is that the various parties of the so-called ruling elite will assert their own personal values in social decision making without due regard for the wider public interests. In Appendix A, three decision maker syndromes (Nos. 44–46) encompass these concerns: the "Yankee-ingenuity syndrome" (decisions made by private enterprise); the "trustee syndrome" (decisions made by government); and "the people-are-wisest syndrome." The latter focuses on the belief that people are the best judges of their own interests.

Our legislative, administrative, and judicial systems, under which social decision making in government operates, has its own system of checks and balances to serve in a fair and judicious manner the diverse interests of society including trade-offs between majority and minority interests. As discussed in the previous section, various laws and executive orders require a certain attention to such trade-offs of values among competing interests and also have provisions for the introduction of public input in the social decision process.

Various methods of gaining insight into the diversity of views, interests and concerns of the public regarding policy or programmatic issues as well as case-related or siting decisions for technological development are employed by governmental agencies. These include public hearings and workshops, invited comment by Federal Register notifications or other means, and direct communications with community and state officials and other concerned parties on field visits. As noted by Starr (1979), conclusions are also assisted by an understanding of the diversity of values and views of the public through polls or psychometric surveys or the method of revealed preference (i.e., the inference of values from observed behavior).

The role of information in values and attitudes, as determined by surveys or observations of human behavior, is especially important. The information resources to which an individual is exposed interact with his or her intellectual capacities and personality traits to form personal values, through a subjective process that combines reason and emotion (Spangler, 1981). The psychodynamic variables in this process often seriously limit the objectivity of opinion survey findings. According to Bowman and Bach (1943):

> The problem of ascertaining the ends, or goals, of social policy is a very complex one. How, in a democratic society, can the attitudes of the majority of people be discovered? It is not enough to take a poll of opinions. Many attitudes are only half-conscious, and most people are only partially articulate. And apparently subtle variations in attitudes are sometimes very significant in revealing underlying differences. Moreover, human beings are neither consistent nor fully informed. Each individual has ideas which are mutually incompatible. Conflicts will be even greater between different individuals.

The mutual incompatibility of ideas or values within a given individual is an exceptionally rewarding area for exploration, especially if the analyst-decision maker wishes to learn more about how likely it is that individuals will change their beliefs or values, and about how different kinds of information affect individual values and lead to change in social values. Both social values and market values aggregate the individual or personal values of various segments of the society/economy. The dynamic interaction of social and market values can, in turn, have a lagged effect on personal values through the hopes and/or anxieties that they raise.

The role of information is so important to the formulation of personal value judgments about the acceptability of technological risks to public health and safety and other environmental conditions that even the *sequence* by which the human brain operates on information can make a crucial difference. For example, a psychometric survey of public attitudes toward 30 diverse kinds of technological risks imaginatively divided respondents into two groups (Fischhoff et al., 1978). One of these evaluated risk attributes before evaluating gross benefits, and the second followed the reverse sequence. Respondents in both groups were asked to provide a numberical "risk adjustment factor," to indicate for any technology (such as nuclear energy) which the respondent did not presently judge to be acceptably safe, that the technology would have to be made X times safer to be acceptable. Trade-offs between dollar costs of improved safety and the increased safety level achievable through modifications were to be included in the process of estimating the risk-adjustment factor. Of course, the value of such assessments by the lay public is seriously questionable, if cost-risk trade-off information has not been provided by qualified technological experts. Nevertheless, it is noteworthy that the group that evaluated risks before benefits provided numerical risk-adjustment factors averaging 23% higher than those of the group that evaluated benefits first.

It would appear that, in using appropriately designed experiments, one might obtain data that would prove valuable for alleviating cognitive dissonance and societal divisions, and for reaching more socially optimal energy policy decisions involving energy or other resource utilization. Such data might also be relevant to industrial or regulatory decisions concerning safety or environmental modifications designed to increase the public acceptance of specific technologies.

The Conflict of Values Between the Individual and the Common Good

As previously discussed, the pursuit of a social decision philosophy which pays close attention to the balance between the totality of good and bad effects of developmental options (i.e., the greatest good for the greatest number) comes into conflict with a societal philosophy that seeks to optimize the equity of effects on individual values. The social decision maker who is conscientiously attempting to reconcile these two philosophies of decision making will quickly come into conflict with those individuals or interest groups who are not "playing the game" this way. That is to say, there are certain individuals or groups which focus primarily on their own perceived interests and give little, if any, visible attention to the impact of proposed development actions or policies on the common good or the conflicting interests of other individuals, groups, or sub-populations.[2]

Indeed, the English philosopher, John Locke, in his *Second Treatise of Civil Government* espouses the notion that "the ideal state of affairs is one in which people are free to act according to their own wants and interests rather than required to act according to moral ideals, either those of others or those espoused by organized society" (May, 1981). Moreover, Alexander Hamilton argued that utopianism (i.e., the happy empire of perfect wisdom and perfect virtue) is dangerous as well as naive: "to eliminate self-interest and factionalism from human affairs, one would also have to eradicate that liberty which is at their root" (May, 1981)

Yet, the "What's-in-it-for-me syndrome" (No. 28) and the related "What's-in-it-for-us syndrome" (No. 29) hold certain perils of their own, even for the self-interest these attitudes basically seek to serve. We live in a society whose overall good—and hence the individual good in the long- if not the short-run—is dependent upon cooperative and, at times, sacrificial action. In the words of Ben Franklin: "We must all hang together, or assuredly we shall hang separately." As noted by Hill et al. (1979), there is a socially important distinction between the legitimate self-interests of persons (or groups) and selfishness:

> A *selfish* person is anyone who tries to satisfy his self-interests without regard for how his doing so affects the welfare of others. Even though he knows it harms them, he does not care. We act selfishly whenever we act as a selfish person would act, and each of us at least occasionally acts just like that.
>
> It is most important to notice that a person who has self-interests can pursue them, if not with avidity then up to a certain limit, without being selfish (indifferent to the welfare of others) in the process. Whereas the selfish man is the paradigm of immorality, the self-interested man is Everyman. The selfish man by definition rejects the moral point of view, since that point of view requires that the welfare (and hence the relevant interests) of all persons, not just the agent, be impartially considered and weighed. The moral point of view does not require that persons have no interest in their own welfare, much less that they have no interests at all. On the contrary, it assumes that there is a plurality of persons, each with his or her own interests, some which are self-interests and others that are not, and that some of the interests of different persons conflict. An ethics without interests is pointless, whereas an "ethics of selfishness" is a contradiction.

Thus whenever conflicts are observed between individual or group values and the common good of

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[2]The distinction made here between groups and sub-populations is that "groups" refers to those identifiable segments of society that are activistic in some particular sense, whereas "sub-population" refers to statistical characteristics of populations such as age, education or sex irrespective of their activistic behavior.

society, the social decision maker must seek to discriminate between selfish attitudes and the legitimate self-interests of groups. A closely related problem is where the self-interests of individuals (or special interest groups), as perceived by themselves, differ from those of the decision maker principally because the latter are exposed to a more comprehensive, and hopefully more accurate, information base in arriving at conclusions regarding the impacted interests. In my view, it is just as important and ethical for the social decision maker to protect the interests of various segments of the public against the penalties of misinformation and too narrowly a perceived scope of short- and long-range and direct and indirect impacts of decision options as is the commonly accepted ethical practice of doctors and lawyers in this regard.

The Conflict of Interests Between Public Groups and Sub-populations

In technological issues where there is a high degree of polarization in the views of protagonists and antagonists, information and value biases can be expected to be the rule rather than the exception. Distortive tactics and other questionable ethics may surface as characterized by the adversarial syndromes of Appendix A (Nos. 47–61). The lay public may be highly confused by such adversarial tactics with a resulting distrust of technological experts and social decision makers who accept certain information or arrive at some conclusions of effects on the public interests that are in line with one or the other of the adversarial parties. In this regard, the social decision maker may be a more or less innocent victim of the "anti-establishment syndrome" (No. 19) and the "guilt-by-association syndrome" (No. 25).

Two other syndromes are especially germane to the resolution of conflict of interests between public groups and sub-populations, namely, the "put-it-in-Texas syndrome" (No. 26) and the "someone-else-pays syndrome" (No. 27). The very naming of the "put-it-in-Texas" syndrome derives from an anecdotal experience while on a field trip to the Indian Point Nuclear Power Plant in the summer of 1975. The U.S. Nuclear Regulatory Commission had ordered Consolidated Edison Company, the owner of the plant, to submit an evaluative report on the economic and environmental impacts of appropriate alternatives for the back-fitting of a closed-cycle cooling system for Unit 2 which had been operating with a once-through (open cycle) cooling system that on the basis of judgmental experience and ecological modeling was believed to provide undue risk to sport and commercial fisheries, especially striped bass. While this protective requirement delighted environmentalist groups, other interest groups in closest proximity to the nuclear plant disliked the aesthetic and other perceived impacts on the human environment of cooling towers. An editorial appeared in the local newspaper (Peekskill, N.Y.) accusing the U.S. Nuclear Regulatory Commission of holding the interests of fish in higher regard than the interests of people, ignoring, of course, that some of the people identify their interests with the protection of fish.

Several of us at the NRC involved in an independent analysis of the effects of cooling tower alternatives were in the process of visiting community leaders and officials to learn first-hand of their views of the adverse and beneficial effects of the cooling system options when, in seeking directions, we incidentally encountered a lady clerk. Learning of our purpose, she proceeded with a long tirade against the evils of cooling towers and finished with: "I don't give a _____(expletive deleted) where they put those towers, so long as they put them in Texas!" Quite obviously, to her the feelings or interests of the people in Texas—or more generically, the siting of an industrial facility near someone else's back yard—deserve no weight in her view of social decision making.[3]

As for the "someone-else-pays syndrome," this too deserves comment. This syndrome accepts the notion that the costs of mitigating environmental and safety impacts of a technological development are of no regard since either business or government will bear these costs out of their enormous financial resources. This syndrome ignores that a major share, if not all, of these costs will be passed along to consumers or citizens in the form of higher prices or taxes, or compensatory reductions in other goods and services. Whether born of naiveté or indifference to the interests of others who bear the increased costs, the often wide public appeal of this syndrome poses another element of distrust for the social decision maker who does not accept such tunnel vision in the decision analysis.

Toward Conflict Resolution

Cartoons often display a social wisdom in a particularly penetrating manner. The "Pogo syndrome" states: "We have met the enemy, and he is us." This syndrome of syndromes indicates quite accurately, I feel, that unless our society works earnestly at shucking some of the more extreme forms of our syndromes in resolving our divisions, all will lose in the long-run, if not the more immediate future. A special issue of *The Environmental Professional* (Vol. 2, No. 1) was appropriately directed to the subject of "Environmental Mediation and Conflict Management," including papers on a closely related theme of the 1980 Confer-

[3]By order of the U.S. Nuclear Regulatory Commission on May 12, 1981, the requirement for termination of once-through cooling for Indian Point unit 2 and 3 was deleted. The abandonment of proposed cooling towers at this site resulted from a settlement agreement, involving environmentalist groups, the state of New York, Consolidated Edison, and the EPA (Temple, 1981).

ence of the National Association of Environmental Professionals.

The fact of conflict of individual and societal values in itself is not an unhealthy state for a nation. Indeed, the absence of conflict would be more harmful to a nation because of the pent-up feelings and hatreds it would harbor. In the responsible interaction between reform and counter-reform movements and the reasoned communication of legitimate but opposing interests in the broader context of the common good, the rate of social and economic progress will undoubtedly be greater than in the absence of revealed conflict and a process directed to conflict resolution.

The quality of the interplay between leadership and followership is especially important in this regard. According to James MacGregor Burns (1978):

> Leadership is a process of morality to the degree that leaders engage with followers on the basis of shared motives and values and goals—on the basis, that is, of the followers' "true" needs as well as those of leaders: psychological, economic, safety, spiritual, sexual, aesthetic, or physical. Friends, relatives, teachers, officials, politicians, ministers, and others will supply a variety of initiatives, but only the followers themselves can ultimately define their own true needs. And they can do so only when they have been exposed to the competing diagnoses, claims, and values of would-be leaders, only when the followers can make an informed choice among competing "prescriptions," only when—in the political arena at least—followers have had full opportunity to perceive, comprehend, evaluate, and finally experience alternatives offered by those professing to be their "true" representatives. Ultimately the moral legitimacy of transformational leadership, and to a lesser degree transactional leadership is grounded in *conscious choice among real alternatives*. Hence leadership assumes competition and conflict, and brute power denies it.

The distinction between transaction and transformation is particularly meaningful in conflict resolution. The transactional analysis of values merely seeks to understand values and attitudes as they are now held by certain individuals or segments of society, whereas transformational analysis seeks to understand how these values and attitudes might change given an improved level of information and more socially responsible rationalization of conflicting values within a given individual as well between parties. The structure of moral leadership is important for the transformational processes involving followers; and responsibilities for such leadership must be shared broadly among the elected leaders, appointed officials, and volunteer activists in our society. An excellent starting point would be more open and candid discussions in non-adversarial forums among the various role-players as to the ground rules or ethics in the moral structure of leadership regarding technological development where divisive issues of risk and environmental protection are of serious concern.

CONCLUSION

Identifiable patterns of individual and group attitudes—characterized as syndromes—reflect deep divisions in our society over the desirability of certain technological developments, their adaptations, and implementation or regulatory policies. Of special importance is the nature of conflicts over the acceptability of safety and environmental risks. Social decision making needs to evaluate such effects on individual values as well as on the common good of society as perceived by various groups or sub-populations. Laws are generally not specific about which ethical decision philosophies should guide the social decisionmaker. Generally, it is felt to be desirable to pay attention to, and attempt to reconcile, three quite different decision philosophies: the greatest good for the greatest number (after Jeremy Bentham); The Pareto optimal rule; and the desirability of major improvements in the equity with which the costs and benefits of technological interventions on the natural and human environments are distributed among various parties of interest including the dimensions of space (e.g., political jurisdictions) and time (present and future generations).

Of the three social decision philosophies, the perfect-equity-now principle poses the greatest practical and theoretical difficulties. Both the Benthamite decision philosophy and the Pareto optimal rule would produce less concern for individual or group equity if "social contract theory" were widely accepted. A social contract exists if parties are willing to be losers in certain developmental actions provided such losses are more than compensated for over a series of such actions (in which other parties may, in turn, be losers). This, then, would result in the attainment of "programmatic" Pareto optimality in that the common good would be served in a net sense as well as all parties would receive some measure of net benefits. Both The National Environmental Policy Act of 1969 and the Executive Order of 1981 involving regulatory impact analysis have significant references to the general welfare or common good of society as well as elemental considerations regarding equity; but neither provides specific guidance regarding the reconciliation of social decision philosophies.

Whenever conflicts are observed between individual or group values and the common good of society, the social decisionmaker must seek to discriminate between selfish attitudes and the legitimate self-interests of such parties. Moreover, it is just as important and ethical for the social decision maker to protect the interests of various segments of the public against the penalties of misinformation and too narrowly a perceived scope of short- and long-range, and direct and indirect, impacts of decision options as is the commonly accepted ethical practices of doctors and lawyers regarding their patients or clients. In the

resolution of conflicts between individual values and the common good of society, as well as between different interest groups, there is a need for more open and candid discussions among the various role players in non-adversarial forums. An appropriate starting point would be the establishment of ground rules for the moral structure of leadership regarding transformation values of technological developments, especially where issues of safety risk and environmental protection are of serious and divisive concern.

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APPENDIX A—SYNDROMES OTHER THAN CHINA AS CLUES TO ENERGY POLICY IN A DIVIDED SOCIETY[1]

As set forth in the following table, the various syndromes represent caricatures of highly polarized views, or biases, and it is likely that many of these would be acceptable to our own views only if modified to some degree or other. The collective nature of the particular syndromes to which an individual subscribes form the *weltanschauung* (or world view) of that person.[2] Biases, of course, may be good or bad depending upon one's philosophical bent and personal experience. What is viewed as ethical values by one group may be disavowed by another; and, even within groups, what is viewed as good or ethical in one situation might be viewed as bad or unacceptable in a different situation. Moreover, views of good and bad inherent in syndromes will generally display a historical course of development, and possibly decay, for each individual subscribing to them. Syndromes are characterized not only by the beliefs they emphasize, but also by the interrelated dialectic considerations they ignore. Indeed, greater attention to the ignored considerations would often tend, if taken seriously and objectively, to disconfirm or weaken the emotional commitment to a syndrome. Since most individuals can safely be assumed to enjoy their syndromes, disconfirming information and concepts tend to be rejected or discounted. The anxiety themes of "future shock" and "limits to growth" are major sources of division in society and account for a number of the syndromes characterized in the table. Other themes relate to the overwhelming nature of the information explosion of modern science and technology and fundamental disagreements over the allocation of responsibilities for decision making and the way key decisions are to be made in the face of a pluralism of societal values and uncertainties over the factual basis and forecasted impacts of decision options. The 73 syndromes set forth in the table are scarcely a closed list. Although developed sporadically over a period of years, it was felt that coherency would be promoted by organizing the syndromes into categories: (1) technological progress syndromes; (2) the bias of personal values; (3) value neglect through procedural bias; (4) institutional biases; (5) the conflict of individual and societal values; (6) societal decision philosophies; (7) biases in gathering and using information; (8) decision maker syndromes: who should decide? (9) adversarial syndromes; (10) safety risk syndromes; and (11) syndromes of rigidity, reconciliation and compromise.

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[1]The table presented in this appendix was initially published in *Risk Analysis: An International Journal* (Vol. 1, No. 3) in an article by the author on "A Note on the Role of Syndrome Management and the Future of Nuclear Energy."

[2]The author himself would consent to a high degree of acceptance of a number of the syndromes, but would scarcely subscribe to ignoring or downplaying the significance of many of the dialectic considerations that exaggerate the emotional commitment to the syndromes.

TABLE 1A
Syndromes Other Than China as Clues to Energy Policy in a Divided Society

No.	Syndrome[a]	Characteristic Features
		I. Technological Progress Syndromes
1.	The Cassandra syndrome	World population and economic growth forebodes disaster for society in the face of fixed land and water resources as well as diminishing supplies of non-renewable resources; reduced (or even zero) growth is a desirable goal along with development of technologies using renewable or ubiquitous resources.
2.	The gee-whiz syndrome	Science has produced many seemingly miraculous inventions and there is good reason for expecting more of the same; fabulous tons of critical minerals dissolved in a cubic mile of seawater, vast uranium tonnages in granite formations or Chattanooga shales, mind-boggling photons of solar energy falling on 1000 square miles of land, hundreds of billions of barrels of oil found in oil shales and tar sands – these are all fair game for technological progress, ignoring leanness of the resource quality, other cost difficulties, or institutional barriers.
3.	We've-gone-about-as-fur-as-we-c'n-go syndrome	The pace of technological progress is slowing down as witnessed in declining rate of productivity gains in our economy; society should tighten its belt and not expect very much further technological progress since the best ideas for commercially viable innovations have already been exploited.
4.	Technological-progress-is-always-good syndrome	If technological advances are feasible, they ought to be promoted else their benefits will be lost along with world leadership; included are innovations that are bigger, better and faster; ignores unintended impacts of technologies.
5.	Technology arrestment syndrome	Technology is a powerful juggernaut pressing on with irresponsible developments, out of control; the pace of technological progress must be arrested until it can be determined without a shadow of doubt to be in the public's best interest.
6.	If-God-meant-us-to-fly syndrome	If God meant us to fly, he would have given us wings; natural processes are best; agricultural technologies should revert back to organic fertilizers, transportation back to walking and bicycling, and other technologies converted to labor consumptive methods; ignores impacts of reduced productivity.
7.	Small-is-beautiful syndrome	Technological progress is fine so long as it involves small or simple technologies whose good and bad features are readily understandable to the public; the digital wrist watch and pocket calculators are ideal prototypes.
8.	Give-me-the-simple-life syndrome	Life itself in modern society is too complex; those technologies should be favored which promote a decentralized, rural (or village) lifestyle; ignores that others may prefer a different lifestyle and the simple life, unwanted consequences.
9.	Holy-Grail syndrome	Only technologies with cure-all prospects for solving major societal problems are worthy of public investments; ignores the extreme difficulties of finding cure-all solutions and the beneficial alleviation of resource shortages by the collective contributions of new technologies with modest individual shares.
10.	Thou-too-shall-pass syndrome	Time-of-ripeness for innovation is conditioned by the acceptance/resistance propensities of societal mindsets with intergenerational cleavages; innovation progress must await the dying-off or passing of power of resistant forces.

[a]A syndrome is a set of concurrent concepts including related emotions and action predispositions that form an identifiable attitudinal pattern.

	II. The Bias of Personal Values
11. The almighty-dollar syndrome	Profit motive, green power, material wealth, prestige; a source of national greatness and security; ignores external and unintended impacts of technology on the human and natural environment.
12. Economics-don't-count syndrome	Environmental, non-materialistic values are supreme; money is the root of all evil; ignores social injury of price inflation and desirability of GNP growth as a means of financing social progress and environmental protection.
13. Nature-has-rights syndrome	The natural order has been perfected through billions of years of evolution; nature has rights independent of human rights; man's harmony with nature requires preservation of current ecological balances by policies of zero growth and zero pollution; ignores on-going dynamics of natural changes and the feasibility of persuading billions of humans to abandon growth aspirations.
14. Jobs-are-great syndrome	The best test of social utility is the number of jobs a technology creates for the region of impact; ignores equity of job losses to other regions and sectors and that too many jobs may destroy the economic viability of the technology.
	III. Value Neglect Through Procedural Bias
15. The apples-and-oranges syndrome	The balancing of costs and benefits in making social choices should only consider those values which can be quantified in commensurable units such as dollars; a mixture of quantitative and qualitative valuations of effects is a no-no because it mixes apples and oranges; ignores adverse impacts of neglecting oranges on societal equity and quality of life.
16. A-Btu-is-a-Btu-is-a-Btu syndrome	Each Btu, regardless of energy form or state, has equal value; quads of energy provide a new system of uniform accounts, replacing dollars; ignores high cost and practicality of some forms of energy in substituting for critical energy resources.[b]
17. Decision-by-computer syndrome	The information complexities of technological issues require that computer-based models provide the key input to societal decisions on options; scenario assumptions underlying the models are accepted uncritically by decisionmakers; ignores importance of causal factors and societal effects for which numerical data are lacking, also the impracticality of ex ante validation of forecasting models.
18. Distrust-of-numbers syndrome	Most, if not all, numbers used as a basis for technological decisions are not to be trusted; many key values such as personal freedom, the continuance of life, the beauty of a mountain stream, or the survival of a species defy quantification; the broad range of uncertainty surrounding many value quantifications is a source of bewilderment if not an invitation to biased use; ignores the societal benefits already achieved through quantitative decision making despite its imperfections.
	IV. Institutional Biases
19. Anti-establishment syndrome	A major source of social ills is big government and big business which are corrupted with power and remote from the interests of the little guy; ignores the special contributions of such organizations to economic and social progress.

[b]A Btu is the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit; a quad is equal to one million billion Btu's.

TABLE 1A (Continued)

No.	Syndrome[a]	Characteristic Features
20.	The bureaucrat syndrome	The duties of a proper bureaucrat are to follow orders and policies set by others and avoid making waves by challenging policies or taking exceptions; rotating crises are to be managed by minimizing public visibility and reaction rather than forward planning to avoid future crises from emerging; ignores a cost-benefit assessment of bureaucratic policies.
21.	The ivory-tower syndrome	Most truly bright and creative persons are to be found in universities with no axes to grind save the public interest; a bulwark for ideals; ignores the penalties of intellectual isolation from real world decisions.
22.	What's-good-for-General Motors-is-good-for-the-country syndrome	National prosperity and national security are tied to the technological innovations and risk capital investments of big business; conversely, poor management of the nation's economy and foreign relations is bad for both business and the country; ignores areas of conflict between corporate and societal interests.
23.	What's-good-for-Arklandfornia-is-good-for-Arklandfornia syndrome	State's rights and interests are supreme in most cases; States can work out problems between themselves without Federal intervention; ignores areas of conflict between local, state, national and international interests.
24.	Stars-and-Stripes syndrome	The effect of technological options on the national interest is the supreme test of public policy; excessive concern for individual benefits and equity considerations will destroy our potential for national greatness; international impacts are to be downplayed except where these clearly involve national interests; ignores social and political costs related to equity considerations.
25.	Guilt-by-association syndrome	University researchers' acceptance of support funds from industry or government introduces moral biases corrupting academic neutrality; likewise government-industry cooperation in technological progress corrupts public servants in protecting wider public interests; ignores societal benefits from cooperative efforts between institutions.
		V. The Conflict of Individual and Societal Values
26.	Put-it-in-Texas syndrome	Technological applications are fine, but put them anywhere except near my back yard; ignores concerns for equity and distributive justice in societal choice in siting options.
27.	The someone-else-pays syndrome	The cost of mitigating environmental and safety impacts of a technology are of no regard since either business or government will bear these costs out of their enormous financial resources; ignores that a major share, if not all, of these costs will be passed along to consumers or citizens in the form of higher prices or taxes, or compensatory reductions in other goods and services.
28.	What's-in-it-for-me? syndrome	Self-interest is supreme; environmental disruptions of technology are acceptable if there is a net personal benefit; ignores equity considerations and the individual's personal stake in the national interest or the common weal.
29.	What's-in-it-for-us? syndrome	Special interest groups look upon technological interventions in terms of net benefits to their commonly held interests; ignores concern for effects on other groups except for strengthened political alliances.

VI. Societal Decision Philosophies

30. The greatest-good-for-the-greatest-number syndrome	The main basis for public decisions should be the choice of alternatives with the highest ratio of total benefits to total costs regardless of their equitable distribution.
31. The Pareto-optimality syndrome	Technological applications are acceptable in those cases where some parties are better off and none are worse off; ignores that most large energy projects already built or "accepted" for construction could not meet this test as many view it.
32. The perfect-equity-now syndrome	Public decisions should be made to achieve equitable distribution of costs and benefits even if this does not maximize net benefits for society as a whole; ignores institutional constraints on immediate implementation of this policy and induced hardships of rapid change.

VII. Biases in Gathering and Using Information

33. Tunnel-vision syndrome	The world is too complex to deal with all interrelated issues in a single analytical framework; the best approach is by piecemeal analyses performed by specialists with mastery of in-depth knowledge of limited areas of analysis and decision; ignores societal penalties of fragmented, unorchestrated decisions.
34. Broad-brush-thinker syndrome	Complex technological problems can't be treated effectively in the vacuum of piecemeal analyses; the best approach is through generalists who have broad knowledge of technological, societal-impact issues; ignores the societal risks of thinking too shallowly about issues.
35. Group-think syndrome	Individuals who identify their interests with a particular professional, social set, or public interest group tend to adopt the values and related information biases most popular with that group or professional; ignores the penalties of information bias and loss in societal cohesion.
36. The pollster syndrome	The main basis for public decisions should be the values, attitudes and preferences of society as determined by polls; future (or desirable) changes in these values are usually ignored as well as the values of future generations.
37. The observed-behavior syndrome	The truest interpretation of societal values derives from the observed behavior of individuals or interest groups and this should be the main guide for public decision along with the forecasting of behavior shifts; it may or may not ignore the forecasted behavior responses of future generations to policy and program options.
38. The cookie-cutter syndrome	The most efficient way to make technological decisions with repetitive treatment of issues is either to standardize the technology or to establish threshold criteria to routinize decisions; the small fraction of cases exceeding the thresholds will be treated by exception; ignores the equity penalties of generic solutions and their tendency to stultify improvements.
39. The custom-tailor syndrome	Technologies where the choice of sites have variable consequences for the impacts on the natural and human environment can only be treated fairly by using custom-tailored technological designs and site-specific analyses of decision options; ignores the social and economic penalties of the resulting regulatory complexities and induced delays.

TABLE 1A (Continued)

No.	Syndrome[a]	Characteristic Features
40.	The historical-paradigm syndrome	The only reliable information for decision making is that derived from historical experience or data; the only information to be trusted is that generated from hard data and impeccable scientific methodology; subjective and speculative information should be disallowed as a basis for deciding on technological options; conflicting lessons from history are ignored including the lesson that past trends and present values do not always continue into the future unchanged.
41.	The euphoric-scenario syndrome	Imaginable future developments with euphoric societal effects are presented as realistic, practically-as-good-as-attained scenarios; ignores that the simplistic scenario logic bathed in a stream of could-be's and might-be's was not examined in the light of potential economic and political constraints or other factors impacting the likely outcomes.
42.	The put-it-in-a-nut-shell syndrome	Complex technologies with multiple social effects have vast information requirements for rational decisions; rebelling against information overload, the public and decision makers alike desire the information to be condensed to the limits of rather small appetites, unmindful or indifferent to penalties or oversimplification, loss of persuasion and defensibility.
43.	The Pandora's-box syndrome	The gathering or revealing of information that would evaluate certain controversial issues is abandoned out of anxiety over the uncontrollability or unpredictability of public reactions which would thus countervail against the larger public interest; it is felt that a little bit of knowledge can be a dangerous thing and that adequate knowledge may be impractical to develop on a timely basis; intuitive judgment supplants formal analysis in public decisions on such issues; ignores loss of public trust and that the box's contents may prove to be too weighty to remain contained.
		VIII. Decision Maker Syndromes: Who Should Decide?
44.	Yankee-ingenuity syndrome	Yankee ingenuity resulting in private enterprise decisions with limited government intervention has blessed our society with the highest standard of living in the world; necessity is the mother of invention and private industry has performed well in perceiving and responding to such needs; ignores the social penalties of unintended consequences of the unfettered decisions of free enterprise.
45.	The trustee syndrome	Most key public decisions are too complex and technical to be understood by the public; public decision makers must behave as trustees over environmental resources for present and future generations using their expert knowledge of technological, ecological, and social systems in the best interests of present and future society.
46.	The people-are-wisest syndrome	The people are the best judges of their own interests; trustees are not always to be trusted because of personal bias and inadequate expertise; technological decisions should be determined by democratic political processes and appropriate voter referenda; ignores changing societal values and adequacy of knowledge by lay persons.
		IX. Adversarial Syndromes
47.	It's-just-a-game syndrome	For many the accepted ethics in public conflict situations is to deal with opponents in the manner of game playing; within reasonable limits exaggeration of facts or values is permissable and hidden agendas or

	concealment of self-damaging information or motives are fashionable ploys until effectively challenged; ignores that truth and candor have their own virtues inviting public trust and that in a lengthy contest truth will have its out.
48. The other-guy-has-the-burden-of-proof syndrome	Conveniently ignoring the unprovable nature of the future or other uncertainties faced by decision makers, the question of burden-of-proof arises; among opposing interests the burden is always sought to be placed on the other guy.
49. The head-in-the-sand syndrome	The irreducible nature of uncertainties regarding certain issues is held to be of paramount concern; the best strategy is to avoid speculative and controversial debate on these issues by closing one's eyes to them; ignores that rejecting speculative considerations may introduce value impact decisions leading to sub-optimal choices.
50. The let's-pick-an-expert syndrome	Since experts are known to disagree on certain issues, each opposing party recruits experts with views favorable to their cause; ignores whether the expert is adequately qualified on the full range of factors and issues.
51. The Achilles-heel syndrome	Flaws of fact, logic or incompleteness are sought to discredit adversaries, purposefully skirting areas of potential agreement; since perfection is unlikely, both sides may be discredited leaving the public bewildered.
52. The yes-or-no syndrome	Yes-or-no answers are insisted upon for technology-related issues having numerous gray areas; one-armed scientists are sought who will not respond "on the other hand"; failure to provide clear, decisive answers is viewed as an admission of inexpertise and buck-passing; ignores that experts may be pressed to deliberately appear more certain than available facts or reliability of scientific methods would justify.
53. The pied-piper syndrome	The protagonist of a special interest group promoting a given technological development only plays upon cheerful notes and themes; by avoiding discordant ones reality is converted to pipe dreams in order to maximize the number and enthusiasm of followers.
54. The St-George-and-the-dragon syndrome	An antagonist with a special interest in the ego rewards of leading the good fight against evil forces and reaping cannonades of applause from the grandstand he or she cares about.
55. The smart-bunny syndrome	In the face of attack by opposing parties, the smart bunny knows how to survive without serious injury by alternately freezing (i.e., by ducking or finessing issues) or by taking a fleeting, zig-zag course of argumentation that obscures and frustrates the aim of the opponent.
56. The dumb-bunny syndrome	In an adversarial method of resolving technological issues, being open and candid exposes weaknesses which result in cheap shots by adversaries with fatal consequences.
57. Time-wounds-all-heels syndrome	Opponents with extremist views are viewed as heels whose untenable, distorted positions will inflict self-destructive wounds in due time; society muddles through in the conflict between reform and counter-reform movements with growing public understanding of inaccuracies and exaggerations of opposing extremists.
58. Maginot-Line syndrome	Self-styled protectors of the public interest adopt a bulwark mentality which bars the passage of technological innovation unless its proponents can provide complete and satisfactory answers to each and every doubt of the public defender; ignores the ultimate pregnability of inflexible defense by the gathering strengths of positive forces and their bypassing of non-crucial positions.

TABLE 1A (Continued)

No.	Syndrome[a]	Characteristic Features
59.	Not-invented-here syndrome	Persons of power and influence tend to resist solutions to technological issues if their participation was by-passed in the early stages of decision making; sensitivities to ego space and hierarchial responsibility within participating institutions or groups must be observed to consummate timely and effective decisions.
60.	Tainted-expert syndrome	Doctors, lawyers, petroleum engineers, nuclear engineers, radiation physicists, marine biologists, etc. having greatest expertise for the resolution of technological issues are distrusted because of the obvious impacts of decision options on career interests.
61.	Unvarnished-hero syndrome	In public decisions on technical issues trust should be placed in the views of non-experts with no vested interest; public figures of known integrity and wholesome values are candidates for such trust; ignores the risk of societal penalties in discounting the views of technical experts.
		X. Safety Risk Syndromes
62.	The zero-risk syndrome	Human life is priceless and therefore all technologies should have demonstrable zero risk else public decisions to introduce them are immoral; ignores resource limitations on the societal affordability of opportunities for risk reduction and loss of potential benefits in taking calculated risks.
63.	Damn-the-torpedoes syndrome	Our society owes much to the courage and entrepreneurial spirit of our founding forefathers, pioneers of new surgical techniques, railroads, skyscrapers, automotive and electrical technology; a society intimidated by excessive concern for risk avoidance will stagnate and ultimately decline; ignores penalties of unsuccessful decisions.
64.	The why-worry syndrome	We are all in the grip of Fate and will die only when our time comes; excessive worry about death or other risks detracts from the quality of life; ignores the avoidance of unnecessary suffering and untimely loss through improvements in risk management.
65.	The Divine Protector syndrome	Someone greater than us is watching over our welfare and merits our trust; earthly values are tiny compared with eternal values of a life in the hereafter; ignores personal responsibility for making wise decisions regarding risks.
66.	The involuntary-risk syndrome	Public decisions on technological developments should not impose involuntary risks on individuals; loss of freedom and consitutional rights to life, liberty and pursuit of happiness are violated thereby; ignores the inherent conflicts of personal and societal freedoms including inter-generational equity conflicts.
67.	A-death-is-a-death-is-a-death syndrome	The objective risk standard for technological innovations is to compare the estimated deaths associated with the options; all such deaths should be given equal weight in the interest of equity; ignores indirect consequences of deaths.
68.	The catastrophic-risk syndrome	Some technologies have greater potential than others for catastrophic events with a large number of concurrent deaths introducing concerns for societal resiliency and psychic costs; catastrophic deaths should be given greater weight in risk decisions than an equal number of deaths diffused over space and time; ignores wide range of equity considerations.

69. The newness-of-risk syndrome	The risks of new and complex technologies are not well understood even by the experts; since anxieties to the public over new risks are enhanced due to controversy among experts and lack of personal knowledge, the technology should not be applied until it is perfected in the laboratory; ignores the importance of learning-by-doing in real world settings as well as loss of potential benefits due to prolonged lag of technological application.
70. The Murphy's Law syndrome	Imaginability of potential failures of man-machine systems should be a crucial factor in public decisions regarding technological risk acceptability; since no one can prove that what could happen won't happen, this is sufficient cause for rejecting the technology; ignores that Murphy's Law is a salient feature of design philosophy involving redundancy and defense-in-depth principles.
XI. Syndromes of Rigidity, Reconciliation and Compromise	
71. The scare-crow syndrome	Polarization of factions on technological issues results in postures of stark menacing rigidity; the mere observance of which is intended to put opposing forces to flight, itself staying immune to sensory inputs of disconfirming intent; ignores the immobilization of societal progress and the mutual benefits inherent in flexibility and compromise.
72. The Philadelphian syndrome	Societal interests in resolving technological issues will be served best by reconciliation through negotiation and compromise; attitudes of good will and brotherly love are essential to reconciliation; ignores problem of what to do about irreconcilables.
73. The Gordian-knot syndrome	The ultimate societal solution when all else fails is to resolve divisions over technological issues through Court decision or legislative changes; political decisions reflect the art of compromise.

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SOCIETAL AVERSION TO CATASTROPHIC AND INVOLUNTARY RISKS OF NUCLEAR POWER *

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SOCIETAL AVERSION TO CATASTROPHIC AND INVOLUNTARY RISKS OF NUCLEAR POWER

Miller B. Spangler

SYNDROMES AND PERSONAL DECISION PHILOSOPHIES

The purpose of this paper is to discuss the weight to be given in nuclear regulatory decisions to societal aversions to catastrophic and involuntary risk. Even before the nuclear accident at Three Mile Island there were deep divisions over the acceptability of nuclear power. Although pre-TMI opinion polls revealed that a majority of the public accepted nuclear power, a smaller fraction was willing to have such facilities near their residence.[1] Many analysts of public risk perception note the dominant effect of the catastrophic and involuntary aspects of nuclear risks on public aversion.[2, 3]

Personal decision philosophies and information premises bearing on the acceptance or rejection of technologies are complex and variable. While several researchers [4, 5] indicate the importance of attitudes in risk perception, it is useful to consider that persons organize their attitudes in focal clusters, or "syndromes". A syndrome may be viewed as a set of concurrent concepts, including related emotions and decision predispositions, that form an identifiable attitudinal pattern.[6] In prior work, the author identified 73 such syndromes.[7] Some examples include: the small-is-beautiful syndrome, the Murphy's Law syndrome, the anti-establishment syndrome, the apples and oranges syndrome, the Pandora's Box syndrome, and the put-it-in-Texas syndrome. Speth characterizes our outlook on the acid rain problem as the Sisyphus syndrome.[8] Syndromes reflect accepted notions of how to achieve the "good life" or, alternatively, our anxieties and the patterned ways of subduing them. The negative category includes catastrophic and involuntary risk syndromes discussed in this paper.

THE CATASTROPHIC RISK SYNDROME

In a report on quantitative safety goals, the NRC Advisory Committee on Reactor Safeguards discussed risk aversion, suggesting extra weight be given to potential catastrophic deaths from nuclear accidents versus dispersed deaths from alternative energies.[9] Their trial α-model for assessing equivalent social cost of early deaths from catastrophies computes this cost by raising the actual deaths by an exponential factor of ($\alpha = 1.2$). Thus, 100 catastrophic deaths yield the equivalent social cost of 250 dispersed deaths from non-catastrophic causes, and 1000 catastrophic deaths equals 4000 dispersed deaths.

The author has no basic problem with the notion that catastrophic risk possesses gravity beyond non-catastrophic risk.[10] On the other hand, I agree with those who take the position that a-death-is-a-death-is-a-death. Deaths intrinsically have equally tragic consequences for the life cut short or the surviving friends and relatives whether they occur in dispersed fashion or concentrated in catastrophies. What gives catastrophic risk a greater gravity is not death per se but the non-fatal impediments that accompanies catastrophic events which the affected community must bear. Included are effects related to "societal resiliency" and those involving "psychic costs" that range from anxiety over illness and delayed death to financial worries, aggravated emotions, and consequent loss of community identity and cohesion.

Societal resiliency includes the time lapse and degree of recovery from unusual stresses on medical and other social facilities as well as economic (or income-producing) activities including an abnormal rate of business failures

and personal bankruptcies. There are important interrelationships between psychic costs and societal resiliency effects. Analysis is further complicated by a legion of catastrophic scenarios potentially resulting from severe nuclear accidents. Moreover, apples and oranges problems abound since many of the above effects are basically intangibles and, where quantitative assessments are practicable, they are often not in commensurable units.

The above ACRS model proposes solving the uncertainty and incommensurability problems of the non-fatal consequences of catastrophic events by sweeping them into one basket labelled "oranges", which are then transformed to the equivalency of "apples" (i.e., deaths) by a simplistic exponential conversion factor. Although this Gordian knot solution is admirable in intent, its herculean and obscurant quality make it less defensible than the "list-and-discuss" treatment that has met the acceptance of the courts whenever intangible effects are involved, or their "remote and speculative" attributes invite "crystal-ball" inquiry.[11] Moreover, a balanced perspective on the potential fatal and non-fatal effects of nuclear catastrophes requires analytical attention to the probability coefficients of these effects and the cost-effectiveness of mitigative strategies. A balanced perspective also requires a comparative discussion of the acid rain and greenhouse effects of the coal alternative that may yield aggregative, non-fatal societal resiliency and psychic cost effects with tragic consequences involving personal and community stresses potentially matching or exceeding those for catastrophic nuclear events.

THE INVOLUNTARY RISK SYNDROME

The lay public perceives risks differently than these are assessed by experts. There are also differences in the assessment of net benefits, which

are less well-defined by technical experts than risk attributes.[12] Out of this confusion, it is not surprising that society is divided over the acceptability of nuclear power.

Occupational risks are felt to be voluntary since workers are free to find other employment. On the other hand, the siting of a nuclear power plant imposes involuntary risks for that public segment which feels net benefits do not compensate for the risks. Yet, the construction instead of a coal-fired plant would impose involuntary risks on the public that prefers nuclear power. The average American family moves every 5 to 7 years -- well within the 6 to 12 years for constructing a coal or nuclear plant. The reluctance to move during this period or soon thereafter is a limiting measure of the duress imposed by the involuntariness of risk. Numerous ethical issues of equity in facility siting and risk mitigation must be dealt with regarding the involuntary risk syndrome including effects on future generations.

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THE ROLE OF INTERDISCIPLINARY ANALYSIS IN BRIDGING THE GAP BETWEEN THE TECHNICAL AND HUMAN SIDES OF RISK ASSESSMENT *

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THE ROLE OF INTERDISCIPLINARY ANALYSIS IN BRIDGING THE GAP BETWEEN THE TECHNICAL AND HUMAN SIDES OF RISK ASSESSMENT[1]

Miller B. Spangler

ABSTRACT

It is readily observable that there is a wide gulf in the manner by which the lay public and technical experts assess the risks of complex technologies and assimilate these assessments in decisions regarding the acceptance or rejection of technological options. On the public side, this gap in methods and value assessments is a major source of distrust of technical experts and disaffection with the social management of technology. From the viewpoint of the technical experts who introduce or regulate technologies, this gap is both a cauldron of frustration and a perceived justification for paternalistic, technocratic decisionmaking that further alienates important segments of the public. It is the author's belief that unless our society learns how to progress in bridging these gaps within the framework of a comparative mode of risk-cost-benefit analysis of options, the potential net benefits of certain technologies such as commercial nuclear power could well be lost to our society. Research on public risk perception, while potentially an important component in achieving this objective, needs to be restructured from its present static orientation to meet the needs of forward-looking decisionmaking that accommodates dynamic learning processes of both the public and technical experts as well as the "learning curves" of technological improvements historically accompanying successful innovations. Moreover, no less attention needs to be devoted to improved benefit assessment along with ethical and equity considerations in decisionmaking involving the reconciliation of conflict between individual and societal interests. This paper examines the vital importance of interdisciplinary analysis in fulfilling these needs.

1. GAPS IN THE TREATMENT OF TECHNOLOGICAL RISKS BY TECHNICAL EXPERTS AND THE LAY PUBLIC

In a variety of energy, chemical, and bio-engineering industries, public perception of risks to the natural and human environment have become significant stumbling blocks to the regional, if not national, acceptance of these technologies. This has introduced issues in public policy development such as: "How safe is safe enough?" "How remote is remote enough?" -- and, in the case where risk assessment is fraught with a high order of scientific uncertainty, "How certain is certain enough?" and "Who should bear the burden of proof?" Since there are trade-offs between risks, costs and benefits in technological systems designs, siting considerations, and the costs of added

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[1]This article is based on seminars presented by the author on October 16, 1981 at the Carnegie-Mellon University, Department of Engineering and Public Policy.

knowledge, the proper questions should be: "How safe is too safe?" "How remote is too remote?" and "How certain is too certain?"

There is probably no technology that is presently more beseiged by issues of these kinds than commercial nuclear power. In the view of many, if nuclear power is not a dying industry, it is at least suffering from a bad case of hypothermia. No new nuclear plants have been ordered in the United States for three years, a period in which several dozens of coal-fired electric generating plants have been ordered. A number of reasons have been suggested for this state of affairs by Denton(1) and others. One such explanation, expressed by Ahearne(2) (Commissioner of the U. S. Nuclear Regulatory Commission) emphasizes that nuclear power's fatal flaw in the United States is that it cannot get public acceptance and concludes:

> "I do not foresee that fatal flaw being eliminated. The deep hatred and divisions within the United States public on the issues of nuclear power, the uncertainties of accidents, the confusion over what is radiation, the fear of abnormalities and serious cancers in future generations, I believe will lead to the demise of commercial nuclear power in the United States."

In a recent report(3) the President's Nuclear Safety Oversight Committee stressed such factors as a decline in the growth of electricity demand, high interest rates, and tightness of capital markets; but also it highlighted political uncertainties conditioned by public opinion as potential risk deterrents to utility investments in nuclear power:

> "If the decision to order the new nuclear power plant were made today, the plant could begin producing power in 1993-95. What could happen in the interim? Could some President or Congress, Governor or State Legislature, Nuclear Regulatory Commission or Public Utilities Commission be anti-nuclear? In fact, this period is likely to include 2-3 Presidents, 3-4 Governors, and 6-7 Congresses, State Legislatures, NRCs and PUCs. Is there a reasonable likelihood of an accident of Three Mile Island (TMI) proportions, or worse, during the ensuing 12-14 years at one or more of the 200 nuclear power plants operating in the world? How could that affect public opinion, political referanda, and thus the prospects for the utility's new nuclear plant? (TMI-1 is an operable plant that has not been permitted to restart after the TMI-2 accident.) These "political" uncertainties may not be quantifiable in the more precise terms in which analysts compare costs of alternative projects. But can the prudent director ignore these risks in his investment decision?
>
> Obviously there is some risk that the coal-fired plant might be subjected to crippling delay. The possibility of a new wave of environmentalism that highlights the health effects of burning coal beyond the company's ability to abate air pollution by modifying the plant or its operations cannot be excluded. (In fact, the best current scientific studies indicate that the mortalities and morbidities from coal are likely to exceed those from nuclear power generation.)

But these risks appear of a markedly lower order than those posed by the new nuclear power plant."

In a nuclear policy statement issued on October 8, 1981, the President(4) announced a series of initiatives to reduce regulatory uncertainty with the objective of shortening the time involved to proceed from the planning stage of a new nuclear plant to an operating license to 6-8 years, as is typical in some other countries. In recognition of deep-seated problems besetting the nuclear option that may not quickly be resolved, the President directed the Secretary of Energy and the Director of the Office of Science and Technology Policy to meet with representatives from universities, private industry and the utilities to report on the obstacles which stand in the way of increased use of nuclear energy and the steps needed to overcome them.

It seems clear to the author that among these deep-seated problems is the persistent wide gulf between how technical experts assess the risks of nuclear power and integrate these assessments into policy or case-related decisions and how the lay public perceives these risks and decides to accept or oppose the nuclear option. Elemental considerations of treatment comprising these gaps are set forth in Table 1 which highlights differences in risk assessment methods, the basis for trusting information used in these methods, the scope and importance accorded various risk attributes, technological considerations of design as related to Murphy's Law and empirical data on equipment and operator failure, and decision criteria used in risk acceptance or rejection.

2. INTERDISCIPLINARY ANALYSIS: THE PURSUIT OF UNCONVENTIONAL WISDOM

There are a number of analysts who point out that the term "risk acceptance" is an improper perspective: society, or an individual within a society, does not accept or reject risks; rather they accept or reject technological developments that have a multiplicity of risk attributes as well as inherent benefits and costs of other kinds.(6,7) These include a wide range of beneficial and adverse effects on the natural and human environments that are direct and indirect, intended and unintended, quantifiable and intangible, short and long term, and rather certain or probabilistic of realization.(8) Sec. 307(c) of Title III of the Energy Reorganization Act of 1974, as amended, imposes annual reporting requirements for the Nuclear Regulatory Commission (NRC) to provide a "clear statement of the short-range and long-range goals, priorities, and plans of the Commission as they relate to the benefits, costs and risks of commercial nuclear power."

It is quite obvious that the assessment of such a wide diversity of beneficial and adverse consequences involves knowledge and scientific methods from a large number of scientific disciplines. Indeed, the National Environmental Policy Act of 1969, as amended, requires (Sec. 102) that all federal agencies shall "utilize a systematic, interdisciplinary approach that will insure the integrated use of the natural and social sciences and the environmental design arts in planning and decisionmaking which may have an impact on man's environment." On an international level, the Scientific Committee on Problems of the Environment (SCOPE) -- an organization of the International Council of Scientific Unions -- has recognized at the outset of its activities that environmental science cannot be effectively pursued except on an

Table 1

Gaps in the treatment of technological risks by technical experts and the lay public[2]
(some generalizations having notable exceptions)

APPROACH	TREATMENT COMMON TO EXPERTS	TREATMENT COMMON TO THE PUBLIC
1. Risk Assessment Methods		
a. Expression mode	Quantitative	Qualitative
b. Logic mode	Computational • Risk = consequence x probability • Fault trees/event trees • Statistical correlation	Intuitive • Simplistic rationale • Emotional input to value judgments
c. Learning mode	Experimental • Laboratory animals • Clinical data for humans • Engineering test equipment and simulators	Impressionistic • Personal experience/memory • Media accounts • Cultural exchange
2. Basis for Trusting Information		
a. Source preference	Established institutions	Non-"establishment" sources
b. Source reliability	Qualifications of experts	Limited ability to judge qualifications
c. Accuracy of information	Robustness/uncertainty of scientific knowledge	Minimal understanding of strengths and limitations of scientific knowledge
3. Risk Attribute Evaluation		
a. Low frequency risk	Objective assessment/conservatism	Tends to exaggerate or ignore risk
b. Newness of risk	Broad range of high and low estimates	Tends to exaggerate or ignore risk
c. Catastrophic vs. dispersed deaths	Gives equal weight[3]	Gives greater weight to catastrophic deaths
d. Immediate vs. delayed deaths	Diverse views over treatment of incommensurables and discount rate	Gives greater weight to immediate deaths except for known exposure to cancer-producing agents
e. Statistical vs. known deaths	Gives equal weight	Gives greater weight to known deaths
f. Dreadness of risk	Generally ignores	Gives greater weight to dreaded risk
g. Voluntary vs. involuntary risk	Gives equal weight	Gives greater weight to involuntary risk
4. Technological Considerations		
a. Murphy's Law (If anything can go wrong, it will.)	Stimulus for redundancy and defense-in-depth in systems design and operating procedures; margins of conservatism in design; quality assurance programs	Stimulus for "what-if" syndromes and distrust of technologies and technocrats, source of exaggerated views on risk levels using worst case assumptions
b. Reports of technological failures/accidents	Valued source of data for technological fixes and prioritizing research; increased attention to consequence mitigation	Confirms validity of Murphy's Law; increased distrust of technocrats
5. Decision Criteria for Risk Acceptance/Rejection		
a. Absolute vs. relative risk	Risk judged in both absolute and relative terms	Greater tendency to judge risk in absolute terms
b. Risk-cost trade-offs	Essential to sound decisionmaking because of finite social resources for risk reduction and impracticability of achieving zero risk; tends to ignore non-dollar costs in such trade-offs	Since human life is priceless, criteria involving risk-cost trade-offs are immoral; ignores risks of no-action alternatives to rejected technology; gives greater weight to non-dollar costs
c. Risk-benefit comparisons of technological options	Emphasizes total (net) benefits to society, neglecting benefits that are difficult to quantify; also neglects indirect and certain long-term benefits	Emphasizes personal rather than societal benefits; includes both qualitative and quantitative benefits but tends to neglect indirect and long-term benefits
d. Equity considerations	Tends to treat shallowly without explicit decision criteria and structured analyses	Tends to distort equity considerations in favor of personal interests to the neglect of the interests of opposing parties or the common good of society

[2] Adapted from Ref. (1).

[3] For an exception, see the Report of the Advisory Committee on Reactor Safeguards (5).

interdisciplinary basis involving different scientific specializations from the physical, biological and social sciences, including economics, law, and a wide range of other areas of special knowledge such as medicine, psychology, communications and information theory, to name only a few.(9)

However, it is readily observable that the stated NEPA requirements for interdisciplinary analysis and the frequent exhortations regarding its desirability rarely lead to its successful practice. It is important to understand the underlying problems serving as impediments in order that solutions can be developed. One such basic problem is the manner in which specialized fields of study, or scientific disciplines are structured. Most, it seems, have a rather narrowly defined span of knowledge about natural or human phenomena they aspire to encompass in order to permit development of the strengths of in-depth knowledge, or expertise. These strengths are, by the very same token, a major source of weakness for interdisciplinary analysis. Each discipline develops its own spans of information, its own special concepts and jargon, and its own hierarchy of preferences for scientific methodologies that seem best suited to their limited fields of inquiry of work-related responsibilities. Putting professionals from different disciplines together to perform an integrated interdisciplinary analysis of the complex issues inherent in the risks, costs, and benefits of technological options too often results instead in the foibles, frustrations, -- and even, at times, counterproductiveness -- of multi-disciplinary analysis. It is noted that interdisciplinary analysis and multi-disciplinary analysis are alike in covering the scope of scientific knowledge and behavioral insight of two or more disciplines. However, unlike multidisciplinary analysis (which is analogous to mounting additional patches to the quiltwork of analytical effort), interdisciplinary analysis involves a form of hybridization or blending of the incorporated disciplines in which a fully integrated process is sought in a systems analytic framework that encompasses the interacting behavioral and value-productive relationships between causal factors covered by the performing disciplines. Classic examples of hybridization include physical chemistry and social psychology.

A fitting paradigm of multidisciplinary analysis is the behavior of the fabled blind men of Indostan, who focused on analyzing their own special part of the elephant with results as described in the last verse of John Saxe's poem, "The Blind Men and the Elephant": [4]

"And so these men of Indostan
Disputed loud and long,
Each in his own opinion
Exceeding stiff and strong,
Though each was partly in the right,
And all were in the wrong!"

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[4] For insight into the problems, frustrations, and delays of the (multidisciplinary/interdisciplinary) analyses of the 4-year CONAES study (Ref. 10) on Energy in Transition, 1985-2010, see Handler's candid transmittal letter to the Secretary of Energy (pp. v-xi) and also Boulding's sensitive comments on disagreements, found in Appendix A (pp. 613-618).

Another barrier to attaining the objectives of interdisciplinary analysis is the tendency of different kinds of professionals, when assembled as a team, to jostle for favored positions in a hen-pecking order,[5] rather than to adopt the more humble, conciliatory process of learning from each other that is so essential to converting multidisciplinary analysis into the more productive mode of interdisciplinary analysis. Kenneth Boulding, who has done more than anyone I know to advance the cause and practice of interdisciplinary analysis, describes this need in his book Beyond Economics:(11)

> "Economics has a certain reputation - not, I think, wholly undeserved - for being the most scientific of the social sciences, it does possess, I think, a larger body of analytical propositions that are widely accepted by competent persons than either sociology or political science. It also exhibits the marks of the history of a true science, in that it exhibits an orderly development toward greater and greater generality. The older theories - i.e., of the classical economists - can easily be formulated as special cases of the more general modern theory. This very internal consistency and success, however, has developed in some economists a certain spiritual pride which has injured the development of social science as a whole, and I think the profession is coming to realize more and more the necessity for trade among the various disciplines if further specialization is to be fruitful. We are reaching out on all sides today toward a unified social science - a regional federation, as it were, which must be accomplished before we can proceed to that great federation of all knowledge that is the ultimate task of the inquiring spirit. All the social sciences have much to learn from one another, and the same might be said of sciences of any kind."

Another impediment to interdisciplinary analysis is the limitation of scientific method to provide reliable estimates or forecasts of technological effects that appear focal to various disciplines. This difficulty is compounded, as noted by Cumming,(12) whenever trans-scientific elements are encountered that can be asked within the framework of science, but which are beyond the capacity of science to answer. Sometimes, of course, the limitations of science to provide reliable answers to relevant questions are the more mechanical limitations of human, financial or time resources. The greater the limitations of science, for whatever reasons, to provide reliable answers, the greater is the need for wisdom to carry the burdens of analysis and translate the resulting balance of knowledge, judgment, and uncertainty into a meaningful form for decisionmaking. Wisdom, it should be observed, encompasses the bounds of scientific learning but also is built upon a creative and metaphysical imagination that discerns inner qualities and relationships. Each scientific discipline develops its own conventional wisdom patterned after its recognized leaders and which may, if not properly directed, clash with the conventional wisdom of other disciplines, thus leading to the foibles of multidisciplinary analysis described above. Perhaps it is not too strong a presumption to state that the best chances for

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[5]As described by Joseph Coates at a 1971 meeting on Technology Assessment in Andover, New Hampshire sponsored by the Engineering Foundation.

successful interdisciplinary analysis exists if the participants fully understand and accept that the team effort is one of pursuing various forms of unconventional wisdom.

Nevertheless, the imaginative aspects of unconventional wisdom, subject as they may be to personal bias and loss of worldly reality, hold their own perils. This danger has been recognized by Boulding:(11)

> "The noble concept of the unification of science has always attracted the imaginative thinker. It is a concept, however, which has proved disappointing, and perhaps even positively dangerous in practice. It has led either to grandiose overall systems like those of Bacon and Comte, which remain empty because the bulging and slatternly corpus of knowledge obstinately refuses to fit the neat corsets of the system builders, or it has led to something much more dangerous - pseudo-systems which have been satisfying to the mind without being sufficiently true to reality. The Aristotelian system was one such. In the social sciences there are the Marxian system and also that of Veblen. Both these represent premature syntheses in social science - integrations of bad economics, bad sociology and anthropology, bad political science. Nevertheless, because they are syntheses they exert remarkable power over the minds of men, to the ultimate detriment of intellectual progress. They are comfortable mental inns on the long dark road of knowledge; it is little wonder that men seek their warmth and shelter, and that they settle down in them and refuse to continue their journey."

The salient point being made by Boulding is not that integrative, interdisciplinary analysis should be abandoned because of these hazards. The continuing conflict of the conventional wisdoms of the various scientific disciplines also poses danger for our society which is urgently pressing for solutions to the interrelated problems of non-renewable resources and inflation as well as other limits to growth or the attainment or sustaining of the "good life". Rather, a watchword of caution is needed for our adventurous travels in the world of interdisciplinary analysis which seeks quite ambitiously and somewhat gropingly to integrate the contributive wisdom of the various disciplines so that the whole is greater (and not less) than the sum of its parts.

3. INTERDISCIPLINARY ISSUES IN THE DESIGN AND USE OF RISK PERCEPTION RESEARCH

Minus the disillusioned, escapist tone of Otway's article,(6) I find many points of essential agreement with the perspective he provides bearing on the present status or needs of risk perception research:[6]

(1) That risk (and its perception) is only one of many aspects that determine the social acceptability of risk-bearing technologies.

(2) That risk perceptions vary from technology to technology, are a function of situational and institutional contexts, and differ for different social groups--and all this is time dependent.

(3) That it is difficult to see primary (or direct) uses for psychometric studies of risk perception in policy decisions. (I would add to this: as presently designed.)

(4) That technical experts tend to view the "risk perceptions" of the lay public as often exaggerated "misperceptions." (Indeed, if segments of the public perceive risks "realistically," i.e., as the experts feel they assess these risks, there is a disappearance of conflict and sense of problem.)

(5) That the present technical risk literature abounds with confusion over descriptive and prescriptive (or normative) models. The latter, in my view, is the more relevant to policy decisions, which must accommodate, to some degree, ethical and equity considerations in the distribution between interest groups of risks, costs, and benefits of technological options over space and time.(13)

(6) That personal attitudes is a preferred key to the measurement of risk perception as a function of its salient determinants, or beliefs, and the values assigned to their attributes.[7]

(7) That these lay attitudes are based upon more than statistical risk information and, for nuclear power, might be associated with such nuclear power attributes as nuclear weapons, unlimited energy supplies, or technocratic elitism.

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[6]These points have been selectively paraphrased in the interests of brevity and, in some instances, modified somewhat or reinterpreted to make them more descriptive of the author's own views. To the extent there are any serious departures from Otway's views, the author apologizes for assuming that a rough equivalency exists.

[7]I have suggested in Ref. (14) that treatment of attitudes should be organized in a closely related or patterned sense identifiable as "syndromes." A syndrome may be viewed as a set of concurrent concepts including related emotions and decision or action predispositions that form an identifiable attitudinal pattern (Webster's New Collegiate Dictionary).

(8) That greater attention needs to be directed toward what determines people's risk judgments, the number of dimensions needed to describe these judgments, and what are the correlates of these dimensions (such as the syndromes described in Ref. 14).

(9) That it is important to study what benefits mean to people and the components or characteristics of such benefits; benefit perception should receive as much attention as risk perception.

(10) That the role of considerations of equity and other social norms needs to be understood as determinants of people's (and I would add, expert's) judgments of acceptable risk.

(11) That technological acceptability needs to be understood in the context of the public's concern for the legitimacy of regulating institutions and their (analytical and decision) procedures.

(12) That psychometric studies can help understand the dimensions of the acceptance problem for particular cases. However, unlike Otway, I feel that more restricted, but still useful, insights can be gleaned from appropriately designed psychometric studies for generic policy development.

(13) That more attention needs to be directed in acceptability research to real world situations in which acceptability is negotiated among special interests groups in a highly political context, including differential research on attitudes of politically active groups (both for and against the technology options).

(14) That psychometric research (if it is to be of greater value to policy makers) must broaden its approach beyond the conceptual framework of the "flat earthers" (i.e., the present distorted perspective of the lay public as seen in the eyes of the experts). This is not to say that technical experts do not also have distorted perspectives in certain attributes to the question of the social acceptability of technologies that are also deserving of attention as an issue in interdisciplinary analysis. This includes what Otway denotes as unilateral decisions of technical experts based on the hard "facts" of risk and benefit--to the exclusions of those possessing other relevant, but soft, information.

(15) That attitudes toward policy options can be measured as a function of underlying beliefs and values, but in view of the large number of attitude objects, and the perishable nature of the results, such studies can provide useful information to the regulator but are not (generally) sufficient as a firm policy basis.

(16) That policy makers, if only guided by opinion or attitude surveys (and thus bound to select the most popular option) will have betrayed the (broader, long-term) societal interests as presently protected by our special form of (representative) democracy.

(17) That psychometric studies should not be used by the regulator as a basis for attitude change programs.

In particular, the last point of agreement deserves a fuller explanation of the author's views, especially as these relate to the interaction of information and attitude change and the need to focus risk perception research on this interaction. I believe that the interests of democratic procedures (as opposed to autocratic elitism in the social management of technology) will be served best by a dynamic interchange of information between the regulator and those affected by the decision outcomes of regulation and this may, of course, cause attitude changes on both parts. There are numerous channels for accomplishing this, but none is, alas, without serious deficiencies if only because of the limited resources that can be afforded for such processes. Emotional barriers to effective communication might also intervene whenever polarized views are held that lead to cognitive dissonance and the tendency not to be open-minded regarding disconfirming information [see Refs. (8), (13)]. Among these communication modes are direct information exchanges at public hearings or workshops, or with community leaders and officials on site visits.

The most significant indirect methods of information exchange are published information sources available to the lay public and technical experts such as:

(1) Publications of the Nuclear Regulatory Commission (Safety Analysis Reports and Environmental Impact Statements related to individual licensing actions; published reports on technological or generic policy issues or review procedures; Federal Register notifications of regulatory matters, some inviting public input; and speeches or articles by agency officials or staff).

(2) Articles, books, Congressional hearings, speeches, lectures, and seminars by educators, professional researchers, and other thought leaders representing various special interest groups or the common weal.

(3) Media reporting on technological events or issues regarded as "newsworthy."

Knowledge of these types of direct and indirect information is relatively commonplace, but its listing serves to remind us of the inordinate complexity and diversity of information sources which, at one and the same time, may serve to enlighten and also to distort and fuel controversy among experts as well as the lay public over technological issues. Moreover, it illustrates how much we all suffer from information overload and how limited a body of the available information we are able or desire to access. Presumably, technical experts are able to tap a larger fraction of the relevant body of information than the lay public or its political representatives, who may spread their attention over a wider range of public issues than those involved in a more limited field of technological options. Nevertheless, the mono-disciplinary orientation and interests of most experts, as discussed above, contributes to an unbalanced and biased perspective of technological issues and their socially desirable solutions. This in turn biases the perspective in the speeches, articles, or reports they write, their selection of written materials or other communication

channels for personal consumption, and the all-important interpretation or analysis of the information inputs as received.

The generalists, who also contribute to the body of relevant information, suffer from different sorts of biases that are due to lack of in-depth knowledge on key aspects of technological issues. In a Congressional report(15) that highlights the relative strengths and weaknesses of specialists and generalists, the following observation was provided by Senator Henry M. Jackson in the Foreword:

> "Modern-day specialists can make important contributions in decision-making; but there is no substitute in government for the wise generalist with skill and shrewdness in judging the competence of specialists and in determining the operational feasibility and political acceptability of any plan of action. It is a skill that can come when a specialist widens his interests and takes on assignments presenting broadened challenges--particularly the challenges of dealing with people in a range of different situations at home and overseas."

As a policy analyst in a regulatory agency committed to the interdisciplinary analysis of the risks, costs, and benefits of technological options, I appreciate very much the information provided by public opinion polls and public perception research. These provide important insights regarding the profile of current values, attitudes, and opinions of various segments of the public and the information premises (including forecast assumptions) that serve as a basis for these. As public servants, we cannot in good conscience assume that our own set of values are the most appropriate values to serve the best interests of society in both the short and long term. Nor can we assume that society has a homogeneous and fully consistent set of values. Attention of public decision-makers to the diversity and conflict of values within single individuals as well as between different interest groups is essential if principles of equity and distributive justice are to be served.

Yet I do not believe that the best interests of society will be served by taking at face value the current opinions of the public as obtained by the polls and surveys regarding technological acceptance issues. Not only must public decision makers act as surrogates for the interests of future generations (who, of course, cannot be polled). They must also seek to understand how the longer term interests of the present generation will shift with changing circumstances resulting from the implementation of plans and programs--or, alternatively, as forecasted with different scenario assumptions that cover a reasonable range of possible happenings for events or outcomes not subject to the control (or the full control) of society.

Other troubling aspects of taking at face value the surveyed opinions of the lay public are the observable deficiencies of information and logic which interact with the more rudimentary values of individuals in determining their option preferences. For example, suppose a physician found that a patient's initial perception of the risks, costs and benefits of a proposed operation led to a rejection of the operation when it was quite obvious that the patient was poorly informed on certain of these decision attributes. Moreover, on

further dicsussion the physician found that the patient had given little or no thought to the risks, costs, and benefits of having no operation or pursuing other forms of treatment--options which in the best professional judgment of the physician hold a clearly inferior risk-benefit prognosis. Would the physician's practice be an ethical one if he accepted the initial poorly informed views of the patient as a final determinant of the patient's best interests? I think not. At the very least he should provide additional information based on the most reliable scientific sources available including the counsel of other experienced practitioners regarding the most reasonable set of options.

A frequent problem in the use of explanatory analogies is that there may be important differences as well as parallelisms. The above analogy is certainly no exception. It is simply not practicable to make technological or regulatory decisions--especially for high technologies involving complex societal "good" and "bad" effects--where some individuals would not regard themselves as losers in the decision options and others, winners. The ethical principle of "informed consent " and the one-to-one exchange of information between physician and patient is not a real world situation in the social management of such technologies. Regulators will always be confronted with the difficult decisions of exercising, within their legally defined responsibilities and authorities, their best judgment of equitable compromises between different interest groups.

Notwithstanding these differences with the medical risk analogy, I feel it would provide superior insight to the regulatory decision maker to have public perception research that goes beyond a mere provision of a "photographic snapshot" of the current values and attitudes, and the information premises affecting these for different interest groups of our society. In my view such research should explore in the manner of sensitivity analyses the heuristic shifts of values and attitudes of the public as related to variations in informational premises of the form: If attribute "X_i (or attributes X_j, Y_j, etc.) were actually the realized outcome(s) of certain technological/regulatory options, then what would be your valued preferences?

The choice of the X_j or Y_j outcomes to serve as a basis for these sensitivity analyses should, in my view, be based on the high, low or medium estimates (or forecasted outcomes) reflecting a reasonable range of uncertainty among experts. This would supply at least some of the beneficial insight to the regulator as is achieved in the information exchanges between physician and patient in which the information supplied by the physician is his or her expert knowledge of the expected range of outcomes of treatment options and the patient provided information of his or her sense of values as related to these outcomes. This, I believe, would provide a more effective method of assimilating societal values into technological decisionmaking than the present survey methods that basically reflect what societal values and preferences are when based upon a distorted perspective of information premises relative to that which regulators use as a basis for their decisions.

Note that such a use of this heuristic approach to an improved understanding of public perception of the values inherent in more realistic expectations of decision outcomes has nothing to do, in and of itself, with changing peoples

attitudes. However, in my view perception research along these lines would also potentially hold considerable benefit to educators in various fields and especially to political leaders in their important role of conflict resolution. As stated by Burns,(16) the quality of interplay between leadership and followership is highly important:

> "Leadership is a process of morality to the degree that leaders engage with followers on the basis of shared motives and values and goals--on the basis, that is, of the followers' "true" needs as well as those of leaders: psychological, economic, safety, spiritual, sexual, aesthetic, or physical. Friends, relatives, teachers, officials, politicians, ministers, and others will supply a variety of initiatives, but only the followers themselves can ultimately define their own true needs. And they can do so only when they have been exposed to the competing diagnoses, claims, and values of would-be leaders, only when the followers can make an informed choice among competing "prescriptions," only when--in the political area at least--followers have had full opportunity to perceive, comprehend, evaluate, and finally experience alternatives offered by those professing to be their "true" representatives. Ultimately the moral legitimacy of transformational leadership, and to a lesser degree transactional leadership is grounded in conscious choice among real alternatives. Hence leadership assumes competition and conflict and brute power denies it."

4. TOWARD AN IMPROVED PERSPECTIVE OF NET BENEFITS

The potentiality of achieving net social benefits is the main driving force behind the development of all new technologies and their acceptability to the public. In a recent address on nuclear regulatory reform, NRC Chairman Nunzio Palladino(17) discussed actions NRC plans to take "so that nuclear regulation can work to the net benefit of the nation". Net benefits, of course, are understood to mean the summation of gross benefits of whatever kinds minus the summation of costs (both economic costs as well as adverse societal effects whose values are basically independent of market place transactions). In the case of nuclear power, an important element of cost that threatens its public acceptance is that of the associated risks to health and safety and how these are perceived by the public. Accordingly, perception research or public opinion surveys tend to focus on various kinds of risk attributes with relatively scant attention to the various kinds of benefits that prospectively would accrue to society.(18,19) Somewhat greater attention was given to benefit perception in a psychometric study of attitudes toward technological risks and benefits by Fischhoff, Slovic and Lichtenstein,(20) but even here the scope and definition of benefit attributes left much to be desired.(8)

Indeed, the neglect of a sound interdisciplinary approach to assessing benefits along with risks is rather widespread. Table 2 summarizes the presence or absence of risk-cost-benefit considerations in seven institutional studies on nuclear power and alternative energy sources in a review by Sponsler.(21) While all seven studies provided cost comparisons of energy alternatives, only two compared benefits. One of the justifications sometimes used for the neglect of benefits in the comparison of nuclear power with alternative sources of

Table 2. -- Summary of Selected Review Aspects Related to Risk Assessment and Safety Goal Formulation as Found in Seven Institutional Studies on Nuclear Power and Alternative Sources of Energy

REVIEW ASPECT ↓ / STUDY REVIEWED (Short Title) →	1. Nuclear Moratorium (IEA/ORAU)	2. Issues & Choices (MITRE)	3. The Next 20 Years (RFF)	4. America's Future (RFF)	5. Energy in Transition (NRC/NAS)	6. Energy Future (Harvard)	7. Jobs & Energy (CEP)
1. Risk† Definition							
a. Explicit	--	--	--	--	X	--	--
b. Implicit	X	X	X	X	--	X	X
2. Fuel Cycle Coverage							
a. All elements	X	X	--	--	X	--	--
b. Power generation	X	X	X	X	X	X	--
c. Some other elements	--	--	X	X	--	X	X
3. Risk Assessments							
a. Nuclear	QN	QN	QL	QL	QN	QL	QL
b. Coal	QN	QN	QL	QL	QN	QL	QL
c. Other fossil	QN	--	QL	QL	QN	QL	--
d. Solar, hydro & other	QL	--	--	QL	QL	QL	QL
4. Risk Assessment Methodology							
a. Mathematical models	X	--	X	--	X	--	--
b. Judgmental assessments							
(i) by explicit rationale	X	X	X	X	X	X	--
(ii) by assertion	--	X	--	--	--	X	X
5. Safety Goal Treatment							
a. Explicit goals and forms*	X	--	--	--	X	--	--
b. Only indirect information	--	X	X	X	--	X	--
6. Goal Formulation Criteria**							
a. Direct information	X	--	--	X	X	--	--
b. Indirect information							
(i) Safety improvement possibilities	--	X	--	--	X	--	--
(ii) Social acceptance issues	X	X	X	X	X	X	--
(iii) Other	X	X	X	X	X	X	--
7. Risk-Cost-Benefit Considerations†† in Comparing Energy Options							
a. Risk comparisons	X	X	--	X	X	--	--
b. Cost comparisons	X	X	X	X	X	X	X
c. Benefit comparisons	--	--	--	--	X	--	X
d. Tradeoff considerations							
(i) Risk-cost tradeoffs	--	--	X	--	X	X	--
(ii) Risk-cost-benefit tradeoffs	--	--	--	X	X	--	--

†The treatment of "risk" may include social, economic and other environmental values at risk as well as safety and health effects.

††Costs and benefits include more than dollar impacts; regarding societal interests, costs are any adverse impacts and benefits are any desirable impacts.

*With attention to goal forms proposed by Mattson et al. (22)

**With attention to decision criteria for evaluating alternative goal formulations proposed by Mattson et al. (op. cit., pp. 5-10).

LEGEND:

X Denotes information present for the review aspect.

-- Denotes information absent or insubstantial for the review aspect.

QN Quantitative risk assessment.

QL Qualitative risk assessment.

NOTE: When many risk assessments were made, the authors generally used both quantitative and qualitative modes; accordingly, the tabular notations, QN or QL, denote the reviewer's impression of the more dominant mode.

energy for generating electricity is that in their view the principal benefit of the competing technologies is the quantity of kilowatt-hours of electricity generated. Since power plants can be built to provide equal outputs of electricity, then the benefits are, following this logic, the same regardless of fuel source. Still another simplistic view is that the primary benefit of nuclear energy is its potentially lower costs, and hence, lower consumer rates. In several Harris polls, by hypothecating the cost advantage of nuclear power over other types of power to range from -20% to +50%, the overall swing of positive response in the general public was +60% (i.e., from a low of 24% acceptance with a 20% negative cost comparison to 84% acceptance with a 50% cost advantage).(19)

Another benefit sometimes used in comparing energy options is the number of jobs related to the technology.(23) While job creation has obvious attractions for the local economies thus benefitting, the net job creation in the national economy could be either negative or positive, since jobs created by the favored technology may be more or less offset by the job losses in the displaced technologies. Other indirect impacts of employment must also be considered due to related effects occasioned by subsidies, productivity gains or losses, etc. It should be noted that a large number of jobs associated with a prospective technology may price it out of viable competition and that a major contributing factor to the productive and competitive strengths of the American economy historically has been the introduction of labor-saving innovations.

Thus, if psychometric or other public opinion surveys are to achieve a better balance in the examination of attitudes and values regarding the full gamut of risks and net benefits of technological options, it is clear that we need a truly interdisciplinary approach which defines the full scope of potential benefits. This approach must also take into account equity considerations including the conflicts between net benefits at the individual or special interest group level and the net benefits for our nation.[8]

According to Ricci and Molton,(24) judicial reviews by the higher courts regarding the balanced treatment of benefits and risks in regulatory decisions have been quite varied; but whether the mandate of Congress in the governing laws is carefully observed by the agency is the key criterion of the courts. In both the cases of the NEPA and the Energy Reorganization Act of 1974, as amended, that govern the responsibilities of the NRC, a wide scope of benefits is required to be examined. The kinds of benefits the Congress had in mind in passing the latter act are found in Sec. 2(a) under "Declaration of Purpose":

> "The Congress hereby declares that the general welfare and the common defense and security require effective action to develop,

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[8]This focus on national level effects does not imply a neglect of effects of technologies on other nations, since the benefits of international cooperation, the quality of foreign relations, etc. may be regarded as integral to our national interests. The acid rain problem and the nuclear proliferation problem are cases in point.

and increase the efficiency and reliability of use of, all energy sources to meet the needs of present and future generations, to increase the productivity of the national economy and strengthen its position in regard to international trade, to make the Nation self-sufficient in energy, to advance the goals of restoring, protecting, and enhancing environmental quality, and to assure public health and safety.

These benefits, although wide-ranging in scope, require more definitive interpretation and analysis. A composite list of potential net benefits to the nation from the nuclear power option would include:

(1) The expected net saving of lives as well as possible disease reduction from the use of nuclear as opposed to alternative viable energy sources for generating electricity.

(2) The expected net saving of substantial consumer costs of electricity for present and future generations. This is principally due to nuclear fuel costs projected to remain lower than coal fuel costs as well as an enhanced nuclear-coal fuel mix relieving inflationary pressures on coal prices versus the closing out of the nuclear growth option.

(3) The saving of coal resources for possibly more valuable uses of future generations (and perhaps in our own lifetimes) such as liquid fuel conversion, syngas manufacture, or as substitutes for petrochemicals in the manufacture of plastics, fertilizers, etc.

(4) Increased national security and fuel reliability by a reduced dependency on oil for the generation of electricity or the encouragement of electricity uses in place of oil consumption for space heating through the possibly induced lower electricity costs of the nuclear option. (A shared benefit with the use of coal.)

(5) Reduced risk of acid rain and greenhouse effects on property values and income losses versus the possibly lesser increased risk of property value and income losses attaining to the nuclear option.

(6) The possible net reduction of future anxiety (or psychic) costs over limits to growth and other energy-related fears during the period of transition from dependency on depletable energy resources to renewable or ubiquitous energy resources.(8)

Several observations are in order concerning the above formulation of potential net benefits from nuclear power. First of all, what is a cost assessment in an absolute sense (e.g., risk to lives, dollar costs of electricity, etc.) is converted to a net benefit for a technological option if these costs in a comparative mode are less than for optional technologies. For example, regarding item (2) above, if the projected total generating costs using nuclear energy in the Midwest for two 1200 MWe units is correct at $10.6 billion for operation from 1990-2020 versus a projected $13.4 billion for coal-fired units of equivalent electrical output, then the net benefit of these nuclear units

89-459 O - 82 - 17

to the consumers of the region (and hence, to the nation) is $2.8 billion.(25) For different regions of the United States the projected net benefits of this kind for the nuclear option are greater or lesser since the cost of coal transportation enters significantly into these projections.

Regarding net safety benefits (see item 1), Table 3 reveals that the mean estimated excess mortality per year for a 1000 MWe nuclear plant is either 1.0 or 2.9 depending on scenario assumptions. For a 30-year operating life this means that 30 to 87 excess deaths will result for a nuclear plant versus 1260 deaths (30 x 42) for an equivalent coal-fired plant.(25) If these estimates are correct, then a net benefit of 1173 to 1230 lives per nuclear plant will have been saved.[9] For 100 nuclear plants the estimated saving of lives would be around 120,000. The estimated mean excess deaths to the general public downwind from coal-fired electric generating facility (due to air pollution) is 17.3 deaths per year per 1000 MWe plant, or over six times greater than the estimated rate of 2.8 deaths per year from occupational accidents and disease associated with the mining of coal to supply such a unit.(25) These estimates contradict the popular belief that the major source of total loss of life from the use of coal to generate electricity is the occupational deaths of coal mining (a voluntary activity) rather than the (involuntary) risks to the general public from air pollution effects of coal combustion.

One of the difficulties in determining the net benefits from the use of nuclear power versus alternatives is the sizeable range of uncertainty surrounding their estimation. Indeed, most of the above items should involve forecasts of future effects since risk-reducing modifications of energy technologies and regulatory practices are likely to occur. Moreover, there are numerous causal factors, difficult of prediction, that will determine the future relative costs of generating electricity from nuclear or alternative fuels such as coal. Nevertheless, the above list of potential net benefits may provide useful starting points for the interdisciplinary analyses of the comparative risks, costs, and benefits of nuclear and alternative energy sources.

It is regrettable that limitations of space do not permit a fuller discussion in this article of the various attributes of net benefits so often neglected by analysts of energy options and public opinion researchers. It is clear that a large and possibly growing segment of the public see the major ethical issue involved in nuclear power regulation as that of licensing life-taking technologies. However, in a comparative analysis of nuclear power and the most probable alternative (i.e., coal-fired electricity generation), there is reason to believe that nuclear technology may actually produce the (moral) benefits of a life-saving technology. In my view, the real ethical issues involve (1) eliminating possible bias and reducing the range of uncertainty for the excess mortality estimates registered in Table 3 for the coal and nuclear options, and (2) determining and implementing cost-effective mitigation technologies to improve the safety performance of both nuclear and coal technologies where practicable in the best interests of society.

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[9]For a discussion of the considerations and uncertainties entering into estimates for nuclear risk, see Ref. (27).

The "best interests" of society regarding decisions on mitigative options of improved safety require the careful analysis of safety-cost tradeoff considerations as recommended by the President's Commission on the Accident at Three Mile Island.(28) For it is clear that the aggregative cost effects of a numerous sub-set of risk mitigation measures could reduce the net economic savings to society of the nuclear option without possibly justifiable compensatory gains in the aggregate net benefits of nuclear risk reduction. Indeed, if because of such cost escalations in nuclear technology the public and investors perceive the net economic benefits discussed above to have largely disappeared, then both the political and economic viability of the nuclear option will also have disappeared. Moreover, it goes without saying, that whatever the potential life-saving net benefits of nuclear technology might be (before or after further safety mitigative decisions are made), these too will have been lost to society by the closing out of the nuclear option. These ethical issues cut across the conventional wisdom of a number of disciplines already encompassed by the membership of the Society for Risk Analysis. The challenge before us -- and others who join our efforts -- is to seek the potential contributions of truly interdisciplinary analysis in bridging the gap between the technical and human sides of risk-cost-benefit assessment in a comparative mode of viewing decision options.

Table 3. - Summary of current energy source excess mortality per year per 0.8 GWy(e)

Fuel cycle	Occupational		General public		Total
	Accident	Disease	Accident	Disease	
Nuclear (U.S. population)					
All nuclear	0.22[a]	0.14[b]	0.05[c]	0.18-1.3[b]	0.59-1.7(1.0)[d]
With 100% of electricity used in the fuel cycle produced by coal power	0.24-0.25[a,e]	0.14-0.46[b,a]	0.10[c,g]	0.77-6.3[h]	1.2-6.8(2.9)
Coal (regional population)	0.35-0.65[e]	0-7[f]	1.2[g]	13-110[h]	15-120(42)
Ratio of coal to nuclear (range): (geometric means)	42 (all nuclear) 14 (with coal power)[i]				

Source: U.S. Nuclear Regulatory Commission (Ref. 26).

[a]Primarily fatal nonradiological accidents, such as falls or explosions.
[b]Primarily fatal radiogenic cancers and leukemias from normal operations at mines, mills, power plants, and reprocessing plants.
[c]Primarily fatal transportation accidents (Table S-4, 10 CFR Part 51) and serious nuclear accidents.
[d]Values in parentheses are the geometric means of the ranges ($\sqrt{ab}$).
[e]Primarily fatal mining accidents, such as cave-ins, fires, and explosions.
[f]Primarily coal workers pneumoconiosis (CWP) and related respiratory diseases leading to respiratory failure.
[g]Primarily members of the general public killed at rail crossings by coal trains.
[h]Primarily respiratory failure among the sick and elderly from combustion products from power plants, but includes deaths from waste-coal bank fires.
[i]With 100% of all electricity consumed by the nuclear fuel cycle produced by coal power; amounts to 45 MWe per 0.8 GWy(e).

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NUCLEAR POWER: EPILOGUE OR PROLOGUE?

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NUCLEAR POWER: EPILOGUE OR PROLOGUE?*

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"If we but knew whither we are tending, we would better know what to do and how to do it." - Abraham Lincoln

INTRODUCTION

Judging from the continuing stream of nuclear power plant cancellations and downward revisions of nuclear energy forecasts, there is nothing more risky than predicting the future of commercial nuclear power. U. S. Nuclear Regulatory Commissioner, John Ahearne (1981), likens the recent events effecting a dim outlook for the nuclear power industry in the United States to a Greek tragedy. There are others, of course, who take a different view about the future, particularly other nations. Which will prove correct?

To understand the causal forces that have produced the current deep divisions in our society that is curtailing nuclear power, it is desirable to view nuclear energy in the broader, historical context of the technology assessment movement. Technology assessment has been defined by the National Goals Research Staff (1970) as "a systematic planning or forecasting process that delineates options and costs, encompassing economic, environmental, and social considerations (both external and internal) and with special focus on technology-related 'bad', as well as 'good' effects."

Although studies by the National Academy of Sciences (1969) and the National Academy of Engineering (1969) advocated the need for technology assessment, there were those who foresaw potential failure and adverse consequences in opening up

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public debate on a Pandora's box of technological complexities and unforecastable good and bad effects of technological options. Congressional testimony on Technology Assessment (1970) by Dr. Lee DuBridge, Director of the Office of Science and Technology, suggested that it would be ironic indeed if, in developing a mechanism for technology assessment, we were to stifle technological innovation because of failure to take into consideration the broad range of measures--social, economic, and political as well as technological--that can guide technological development along beneficial lines. He cautioned that "We must be sure that we are designing a technology assessment, rather than a technology arrestment mechanism." Our failures in technology assessment and whether there is still time to amend these is especially relevant to the epilogue or prologue question regarding the future of nuclear power.

The quality of a technology assessment is principally grounded in the efficacy of the systematic planning and forecasting processes on which it is based. Regarding such aspects as the risks, costs, and benefits of a major technology and its societal options, planning is a highly fragmented process involving the decisions of industry, governments, voters, consumers, and various other institutions and activist groups. In the case of nuclear power, the U. S. Nuclear Regulatory Commission has no legal authority to perform comprehensive planning for commercial applications of nuclear power and the interrelated forecasting functions on which sound planning must be based. Yet, the National Environmental Policy Act of 1969 and Title III of the Energy Reorganization Act of 1974, as amended, do require the NRC to evaluate the risks, costs, and benefits of proposed licensing actions (and their alternatives) and of the goals, priorities, and plans developed by the Commission (Mattson et al., 1980).

Forecasting the future of any high technology, such as nuclear power, involves a probabilistic judgmental approach in the absence of reliable, scientifically proven forecasting methodologies (Spangler, 1976). Moreover, there has been a sufficient number of cases of positive and negative errors in technological forecasting as to make one wary of crystal ball exercises. A report by the Library of Congress Legislative Reference Service describes a number of blunders in negative forecasting of technological change (Martino, 1968). Indeed, one of the key arguments for developing new domestic sources of energy--as well as retaining a viable nuclear option--is the very unpredictability of the future. Rather than making any pretensions of special expertise in forecasting, I prefer to develop my subject on the future of nuclear power by exploring the technical and causal factors that are consistent with the wide range of uncertainty we face, both its pessimistic and optimistic dimensions.

PESSIMISTIC AND OPTIMISTIC SCENARIOS FOR ALTERNATIVE NUCLEAR FUTURES

The Epilogue Scenario: Supporting Assumptions

Focusing on the events since 1977, it is easy to understand the basis for pessimism about the future of nuclear energy. Repeated references are made regarding the existence of a de facto moratorium on commercial nuclear power in the United States because of an absence of new orders over the past five years. Indeed, even before the accident at TMI, Llewellyn King (1978) made the statement that, "on the basis of today's climate, nuclear power cannot be considered a serious contender among the United States' future energy options." Although pointing out the success of nuclear power developments in terms of yielding low environmental costs and an absence of human fatalities, King's pessimism stems

from nuclear power becoming a bitter national controversy. He views the new class assault on nuclear power as a self-fulfilling prophetic approach in proving that nuclear power is uneconomic:

> "In the United States it takes as long as 14 years to license a plant, thus vastly adding to its cost through the expense of carrying charges, an expense that has been contributed to enormously by the delaying tactics of the opponents and their protracted litigation of every possible issue. The opponents profess environmentalism as their cause, but increasingly the evidence is that they are motivated by some other deep-seated hostility to high technology that is only marginally associated with the environment."

Thus, public perception of high risk for nuclear technology and growing concern for the not unrelated problems of competitive economics are the salient reasons why the epilogue scenario is favored by many persons in their forecasts that nuclear power will become a "technological dinosaur".

But we live in an uncertain world in which it is not without some measure of risk of being wrong in assuming present attitudes or conditions will remain constant in the future or that recent trends can be projected without change. Conversely, predictions of change also have risks of being in error. Accordingly, I do not intend to present forecasts of what I feel will be the most likely course of future nuclear developments in the United States. Rather, I will attempt to outline what I perceive to be certain assumptions concerning future developments that would collectively be supportive, first of a pessimistic,and then of an optimistic scenario of the nuclear future. In the final section I will describe some of the programs being considered or implemented in the United States to improve the viability of nuclear power.

These scenario assumptions are organized in four groups of causal factors: (i) factors affecting the investment climate for power plant additions regardless

of fuel choice, (ii) financial factors of special importance in the investment climate for nuclear power, (iii) social and political factors affecting nuclear regulations and investment climate, and (iv) probabilistic events of moment that might, or might not, happen.

Regarding the first of these causal factor groupings, the present investment climate for the construction of new electric power plants is very weak because high energy prices and induced conservation measures have resulted in a greatly reduced growth in demand for electricity, down sharply from the U. S. average annual rate of seven per cent in the early 1970's. Another factor is that public utility commissions have attempted to curb inflationary impacts on consumers due principally to rising fuel costs by holding down on increases in electricity rates, thereby yielding reduced rates of return on utility investments. Thirdly, double-digit inflation has affected money markets;and the high interest rates for borrowed capital being nearly double those of the late 1960's has further placed a squeeze on the investment climate for power plants. Lastly, rising construction costs for both coal and nuclear power plants, greater than for inflation in the economy as a whole, also contribute to a deterioration in this investment climate.

Quite obviously, a continuation of these adverse financial factors into the future with only a slight amelioration would be favorable to a pessimistic outlook for a resurgence in power plant construction in the next decade. However, as time goes on, even with a sluggish growth in demand increasing replacement of some obsolete or high-cost generating units would be warranted notwithstanding that the other three financial assumptions did not change appreciably.

The second group of scenario assumptions supporting a pessimistic outlook for a resumption of applications for nuclear power construction permits include those factors in the financial climate that are more adverse for nuclear than coal-

fueled plants. These include:

1. Regulatory uncertainty affecting delays in the issuance of construction permits and the escalation of construction costs through backfitting requirements on behalf of safety improvements during the construction period.

2. Similar regulatory uncertainties affecting delays in operating licenses and backfitting costs during plant operation including reduced plant capacity factors due to extended shutdowns for safety modifications.

3. Regulatory uncertainties affecting the cost outlook for the back end of the fuel cycle involving spent fuel storage, waste management and plant decommissioning costs.

4. Questionable adequacy of insurance to cover the full economic penalties of a core meltdown and possibly offsite property damage and personal liability claims. 1/

5. Negative attitudes of bankers and investors regarding nuclear investments and reduced bond ratings for utilities with growing nuclear participation (Hollister, 1981) (Parisi, 1981).

Future events which would increase or maintain these uncertainties or investment attitudes toward nuclear power would support the outcome of the epilogue scenario. To a considerable extent, the probability of this class of assumptions remaining valid will be determined by the outcome of the third class of assumptions that are consistent with a pessimistic outlook, namely, the continuation of an adverse social and political climate. Assumptions consistent with this prognosis would include:

1. Continued knowledge gap and especially the perceptions of a substantial segment of public that nuclear power holds greater risks than alternative fuels such as coal (Fischhoff et al., 1978).

2. Continued growth and fervor of activitist groups who oppose nuclear power.

3. Continued reports of frequent failures and mishaps of nuclear power plant construction and operation reinforcing the "what-if syndrome".

4. Continued high level of distrust of nuclear regulators and industry experts and managers (Firebaugh, 1980).

1/ See "Cost of the Accident", Special Issue of Progress in Nuclear Energy, Vol. 6, No. 1-3, 1980, pp. 76-82.

There are a number of probabilistic events which, if they occurred, would be supportive of the epilogue scenario. These include another major accident equal to or worse than the TMI accident,or possibly major discoveries of low-cost energy resources or technological breakthroughs reducing substantially the cost of alternative energy sources. Included among the latter are such potential energy resources as oil shales, tar sands, natural gas from tight formations or geo-pressured brines, synfuel conversion processes, geothermal energy including hot-rock sources, energy from wind and waves, ocean thermal energy conversion, co-generation, biomass conversion, and various solar energy conversion processes such as solar thermal conversion and photovoltaic conversion. Some of these potential sources are more ubiquitous than others. Also, there may be social and political constraints to overcome as well as the postulated techno-economic developmental success. If the probabilities of breakthrough for any of these developments is not large, the number of candidates is certainly impressive. Many, especially those who oppose nuclear energy, believe that at some time in the future nuclear accidents will occur as well as technological breakthroughs in at least some of the potentially major substitute forms of energy, notably solar energy (Commoner, 1979).

The Prologue Scenario: Supporting Assumptions

For the most part, the assumptions about the future course of developments that would support the realism of the nuclear prologue scenario are basically the opposite of those consistent with a pessimistic scenario. However, since they involve a change from present conditions or recent trends, to many they appear less persuasive. There is no inherently logical explanation why this should be so. Historical analysis of technological, economic, social and political factors lends as much, if not greater, support to the notion that change should be expected rather

than the constancy of present attitudes, conditions, or recent trends. Moreover, it is simply not enough to forecast that some change is likely: the character, timing, and magnitude of change are the most critical ingredients and end products of the forecasting art since change begets change.

History teaches us that economic and social phenomena are subject to three basic patterns of change: (i) cyclical or oscillating, (ii) the S-shaped (Gompertz) growth curves beginning with slow but accelerating growth in infancy, a stable straight-line growth during the middle stage and declining growth rates in the period of maturation or market saturation, and (iii) abrupt discontinuities introduced by cataclysmic or revolutionary events: floods, famines, wars, political events of great moment, technological breakthroughs, resources discoveries, etc. Economic forecasting may involve the superimposition of a composite of all three patterns of change of causal factors acting concurrently. For example, cyclical periods of economic recession may add special, but temporary, impetus to conservation measures and other factors that dampen electricity demand growth. However, there is often the tendency to prepare forecasts by assuming the absence of certain events that would introduce discontinuities/or cyclical perturbations because of their highly unpredictable nature, especially the timing of their occurrence in addition to their probability of occurrence over an extended period of time.

One set of assumptions about future changes that would be causative of the nuclear prologue scenario relate to factors that would yield a substantially improved investment climate for constructing new power plants regardless of fuel choice:

1. Higher profit margins from electricity sales enabled principally by rate increases made politically more acceptable by a slow-down of inflation in fuel prices, among other factors.

2. Lower interest rates for borrowed capital.

3. Reduced rates of inflation in construction costs.

4. Regional growth rates in demand for electricity greater than 3 persent per year.

Regarding the latter assumption, regional demand forecasts, and not national forecasts, are the major basis for utility decisions to add new power plants. Since electricity has some important, though limited, ability to substitute for other fuels in the total energy market, forecasts of demand for electricity are to some extent responsive to, and to some extent independent of, total energy forecasts. The wide uncertainty of total energy forecasts for the United States ranging from 65 to 165 quads by the end of the century (Maize, 1981) certainly provides some room for optimism (as well as pessimism) that total energy growth might contribute substantially to electricity growth. Another possibility causally supporting the optimistic scenario for electricity demand growth is that a number of the more important conservation measures may soon run their course of acceptance. That is to say, conservation measures, no less than the introduction of new appliances and air conditioning, are subject to market saturation involving a declining rate of change as the maturation portion of the Gompertz curve is engaged. 2/ Moreover, in Congressional testimony early this month, a number of expert witnesses forecast electricity to grow faster than other energy forms. 3/

A second set of assumptions that would be contributive to an optmistic outlook for a resumption of new orders for nuclear power plants involve an improved financial

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2/ However, the data base for analyzing saturation in the market acceptance of electrical energy conservation measures is extremely limited.

3/ See, "Electricity: Special Case", The Energy Daily, June 4, 1981, p. 2.

climate toward nuclear investments by reduction of certain unfavorable comparisons to coal-fired plants or certain gains in present factors of favorable financial comparison. The latter have to do with the outlook for relative prices in coal and nuclear supplies as well as reliability of supply. For example, the risks of labor strikes affecting the supply and transport of coal would appear to be greater than for nuclear fuel, in part because of past history and in part due to the drastically smaller ratio in the tonnages of nuclear to coal fuel required in generating the same level of electrical output: a ratio of about 27,000 tons of coal per ton of uranium (yellowcake).

Largely because of the high transport costs for coal fuel and the negligible transport costs for nuclear fuel, the delivered costs for nuclear fuel do not change significantly between regions whereas delivered coal costs do vary widely between regions. A staff study provides data on pre-TMI estimates of the present value costs of coal fuel for an assumed 30-year operating life of a plant coming online in 1990 and averaging 65 percent capacity that ranges from a low of $5.5 billion for the North Central Region to a high of $9.0 billion for the New England Region/ (Spangler,1980). This compares with an estimated nuclear fuel cost of $2.9 billion for each of the same regions if nuclear fuel is recycled and $4.2 billion if it is not recycled.

It is to be noted that the same percentage increases in fuel prices for both coal and nuclear fuels would be conducive to the nuclear option since according to recent estimates (using the Midwest Region as a middle-range example) the estimated value cost of nuclear fuel assuming no recycle is only 40 percent of total generating cost versus 55 percent in the case of coal-fired plants (ibid.). However, there may be reasons for believing that the future price of coal may rise

more sharply than for nuclear fuel. Both nuclear and coal fuel prices escalated sharply along with oil prices in the first several years following the Arab oil embargo of October 1973. Nuclear prices for yellowcake soared from $8 per pound to upwards of $50 per pound. In response to these higher prices new sources of uranium were developed in the United States and world-wide that caused prices to fall to their present level of $23 per pound with possible further declines before resuming an upward trend. On the other hand, coal prices have experienced no similar decline. Indeed, their continued escalation could be exacerbated by the steady depletion of the lowest cost coal reserves 4/ and by mounting pressures of increased coal demand. Included in the latter are sharp gains in our coal exports and the possible conversion of coal to syngas or liquid fuels to serve the transport market. For example, it is estimated that coal could be converted to gasohol at one-half the cost of conversion using agricultural or forestry products.

Another assumption regarding changes in financial factors conducive to the nuclear prologue scenario is that regulatory uncertainties for nuclear plants affecting construction permit delays and construction schedule slippages will be brought under better control so that such uncertainties would be about equal to or only slightly greater than those for coal-fired plants. It is often lost sight of that regulatory problems affecting delays and higher construction costs of coal-fired plants have been mounting along with nuclear plants,albeit to a lesser degree. The relative disadvantage of nuclear power in this regard could be lessened by

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4/ It is estimated that roughly all of the low-cost strippable coal reserves of the United States will have been mined by the turn of the century.

either a worsening of regulatory problems of coal-fired plants or an improvement in regulatory uncertainties for nuclear. The streamlining of nuclear regulatory processes and other measures to reduce licensing and construction delays relative to sources of regulatory inefficiency have been a long-continuing goal by administrative agencies of Federal and State governments as well as the Congress with rather limited success (Schramm et al., 1979).

Other assumptions of an improved financial climate for the nuclear relative to the coal option would include:

1. Cooperative efforts of management and labor leading to reduced inflation in nuclear construction costs.

2. Reduction of regulatory uncertainty for nuclear plants affecting outlook for plant capacity factors, waste management and decommissioning costs.

3. Establishment by NRC of safety goals and related criteria that would improve decisions regarding trade-offs of benefits gained relative to increased costs, including backfitting of safety improvements to operating plants or those in various stages of construction.

4. Improved insurance coverage for the potentially large costs of major nuclear accidents.

The third category of assumptions that would be conducive to the prologue scenario is that there will be marked improvements in the social and political climate for commercial nuclear power. These include:

1. Substantial closing of the knowledge gap between how the public and regulators perceive risks (Spangler, 1982).

2. Better public understanding of the wider scope of public interests and trade-off criteria reflected in regulatory decisions.

3. Substantial reduction of the number of issues where experts disagree as well as the narrowing of the ranges of disagreement among experts on specific issues.

4. Improved public understanding of the spatial and temporal aspects of risks related to the entire fuel cycle of coal in the generation of electricity.

5. A waning of influence of certain groups opposed to nuclear power.

6. A notable reduction in the frequency of the more truly worrisome failures in nuclear power plant construction and operation; reduced media reporting of low-consequence failures; and better public appreciation of the limited importance of certain kinds of failures or mishaps.

One can scarcely overemphasize the importance of the latter assumption if the nuclear prologue scenario is to be realized. Improved public understanding of the comparative risks of the nuclear and coal-fueled options can be expected to be a slow and drawn-out process. However, a reduction of the frequency of the more significant failures in nuclear power plant operation over the next several years and an improved perspective provided by the media as to the relative seriousness of untoward events and the nature of strategies to improve nuclear safety could prove crucial.

The last category of contributive assumptions includes probabilistic events that might or might not happen. These include:

1. Military, terrorist, or political events that would seriously disrupt international oil supplies for a prolonged period.

2. Domestic strikes disrupting coal production or transport for a prolonged period.

3. Major discoveries of low-cost uranium ore bodies.

4. Advances in scientific knowledge leading to firmer convictions of the likelihood, timing, and serious magnitude of potential consequences of the greenhouse effect from burning fossil fuels and the various health effects from coal utilization (CONAES, 1979).

5. Advances in scientific knowledge demonstrating a threshold level for the carcinogenic and other health effects of low-level ionizing radiation, thus eliminating the controversial linear assumption now used for computing the health effects of low-level nuclear radiation (Weinberg, 1977).

PROGRAMS TO PRESERVE THE NUCLEAR OPTION

Any forecast of the future course of commerical nuclear power in the United States must take into account the likely success of current initiatives that would contribute, in combination, to preserving the nuclear option as well as the possibility of additional initiatives already in the discussion stage. There is concern that the continued absence of new orders for nuclear plants will presently dissipate the necessary technical and managerial skills to design, construct, operate and regulate nuclear power plants in a safe, cost-effective manner.

Thus, the United States stands at the cross-roads of decision on the nuclear option. There is a growing list of nations making commitments to the construction of nuclear plants and while a number of European nations are yet engaged in controversial debate, it would appear that most are prepared to move forward even in the face of a faltering U. S. commitment. According to a recent report by the President's Nuclear Safety Oversight Committee (Allison et al., 1981), if commercial nuclear power is to have a future in the United States, it must be: (1) economic, (2) safe, and (3) acceptable to the public. The economics of nuclear power has been adversely affected by the recent high interest rates for borrowed capital that is further aggravated by the lengthening time being experience to plan, license and construct a nuclear plant currently running around 12-14 years. Under these conditions about one half the cost of construction is due to interest and other time-related cost escalations.

In a nuclear policy statement issued on October 8, 1981, the President announced a series of initiatives to reduce regulatory uncertainty with the objective of shortening the time involved to proceed from the planning stage of a new nuclear plant to an operating license to 6-8 years, as is typical in some other countries. In recognition of deep-seated problems besetting the nuclear option that may not quickly be resolved,

the President directed the Secretary of Energy and the Director of the Office of Science and Technology Policy to meet with representatives from universities, private industry and the utilities to report on the obstacles which stand in the way of increased use of nuclear energy and the steps needed to overcome them.

It seems clear that among these deep-seated problems is the persistent wide gulf between how technical experts assess the risks of nuclear power and integrate these assessments into policy or case-related decisions and how the lay public perceives these risks and decides to accept or oppose the nuclear option. Elemental considerations of treatment comprising these gaps are set forth in Table 1 which highlights differences in risk assessment methods, the basis for trusting information used in these methods, the scope and importance accorded various risk attributes, technological considerations of design as related to Murphy's Law and empirical data on equipment and operator failure, and decision criteria used in risk acceptance or rejection. There are, of course, diverse means of providing information to the public and technical experts that would serve to bridge this gap: university and contract research programs, reports of various agencies of government, and the news media. A House Staff Report (1980) examined the Department of Energy's public information programs on national energy needs and made a number of recommendations for major changes, including:

> "The Department of Energy, through new public educational and informational programs, should fulfill its statutory obligations by turning away from highlighting the negative and controversial aspects of central station energy sources including nuclear power and toward publishing the facts on these energy forms, as well as undertaking education programs directed at increasing public understanding and allaying unrealistic fears associated with nuclear energy. An even-handed treatment should be applied to all energy sources."

The report also envisioned an information role for other Federal agencies with responsibilities in this field, namely, the Environmental Protection Agency and the Nuclear Regulatory Commission (ibid., p. 6). The provision of information by Federal agencies that provides a balanced perspective of the risks, costs, and benefits of viable

Table 1

Gaps in the treatment of technological risks by technical experts and the lay public
(some generalizations having notable exceptions)

APPROACH	TREATMENT COMMON TO EXPERTS	TREATMENT COMMON TO THE PUBLIC
1. Risk Assessment Methods		
a. Expression mode	Quantitative	Qualitative
b. Logic mode	Computational • Risk = consequence x probability • Fault trees/event trees • Statistical correlation	Intuitive • Simplistic rationale • Emotional input to value judgments
c. Learning mode	Experimental • Laboratory animals • Clinical data for humans • Engineering test equipment and simulators	Impressionistic • Personal experience/memory • Media accounts • Cultural exchange
2. Basis for Trusting Information		
a. Source preference	Established institutions	Non-"establishment" sources
b. Source reliability	Qualifications of experts	Limited ability to judge qualifications
c. Accuracy of information	Robustness/uncertainty of scientific knowledge	Minimal understanding of strengths and limitations of scientific knowledge
3. Risk Attribute Evaluation		
a. Low frequency risk	Objective assessment/conservatisms	Tends to exaggerate or ignore risk
b. Newness of risk	Broad range of high and low estimates	Tends to exaggerate or ignore risk
c. Catastrophic vs. dispersed deaths	Gives equal weight *	Gives greater weight to catastrophic deaths
d. Immediate vs. delayed deaths	Diverse views over treatment of incommensurables and discount rate	Gives greater weight to immediate deaths except for known exposure to cancer-producing agents
e. Statistical vs. known deaths	Gives equal weight	Gives greater weight to known deaths
f. Dreadness of risk	Generally ignores	Gives greater weight to dreaded risk
g. Voluntary vs. involuntary risk	Gives equal weight	Gives greater weight to involuntary risk
4. Technological Considerations		
a. Murphy's Law (If anything can go wrong, it will.)	Stimulus for redundancy and defense-in-depth in systems design and operating procedures; margins of conservatism in design, quality assurance programs	Stimulus for "what-if" syndromes and distrust of technologies and technocrats; source of exaggerated views on risk levels using worst case assumptions
b. Reports of technological failures/accidents	Valued source of data for technological fixes and prioritizing research; increased attention to consequence mitigation	Confirms validity of Murphy's Law; increased distrust of technocrats
5. Decision Criteria for Risk Acceptance/Rejection		
a. Absolute vs. relative risk	Risk judged in both absolute and relative terms	Greater tendency to judge risk in absolute terms
b. Risk-cost trade-offs	Essential to sound decisionmaking because of finite societal resources for risk reduction and unacceptability of achieving zero risk; tends to ignore non-dollar costs in such trade-offs	Since human life is priceless, criteria involving risk-cost trade-offs are immoral; ignores risks of no-action alternatives to rejected technology; gives greater weight to non-dollar costs
c. Risk-benefit comparisons of technological options	Emphasizes total (net) benefits to society, neglecting benefits that are difficult to quantify; also neglects indirect and certain long-term benefits	Emphasizes personal rather than societal benefits; includes both qualitative and quantitative benefits but tends to neglect indirect and long-term benefits
d. Equity considerations	Tends to treat shallowly without explicit decision criteria and structured analyses	Tends to distort equity considerations in favor of personal interests to the neglect of the interests of opposing parties or the common good of society

* For an exception, see the Report of the Advisory Committee on Reactor Safeguards (1980).

energy options would be especially helpful to the news media as well as educational institutions and state and local governments in their "multiplier" roles for further dissemination of objective information to help the public reach considered decisions regarding the acceptability of nuclear power.

The promotion of nuclear power is not a function of the Nuclear Regulatory Commission. Indeed, the Energy Reorganization Act of 1974, which established the NRC, made it quite clear that our primary responsibility is that of regulating commerical nuclear power in such a manner as to assure adequate public protection of safety and health. Nevertheless, it seems reasonable that the Congress did not intend that our regulatory policies, practices and decisions should be made in a manner that would be "anti-" nuclear power. That is to say, regulatory practices could be regarded as "anti-" if they:

(1) Yielded small marginal gains in safety benefits at the expense of unreasonable costs;

(2) Led to the sort of nuclear safety record or analytical and decision procedures that would undermine public trust and confidence;

(3) Led to unconscionable or unwarranted delays or regulatory uncertainties that deterred utilities and the financial community from seriously considering the nuclear option, or imposed unnecessarily such/high capital costs (delayed) in the/construction of nuclear plants as to turn public opinion from the nuclear option; and

(4) Diverted limited technical review or management resources, either in the NRC or the industry, away from tasks deserving of high priority in the interest of safety to tasks deserving of low priority.

The NRC has launched a number of efforts to improve the effectiveness of its regulatory functions, procedures, and decision criteria so as to avoid unjustifiable, anti-promotional practices of these sorts. In NRC Announcement No. 123 (dated

November 17, 1981) Chairman Palladino established the Regulatory Reform Task Force to evaluate the NRC licensing process for nuclear power plants to take immediate actions to improve NRC effectiveness and to address the question of long-range streamlining of the regulatory process.

The House of Representatives passed a bill (H.R. 2330) on November 5, 1981 that would make such sums as may be necessary available to the NRC to establish an independent Temporary Advisory Panel to carry out the purposes of Sec. 13 of the Bill. The Panel would have broad representation from State utility regulatory agencies, the National Governors Association, the nuclear power industry, and citizen or environmental organizations. The panel would consider the effectiveness of the nuclear power plant licensing process regarding such matters as the adequacy of safety and environmental protection, licensing delays, unnecessary duplication of effort, stability and predictability of licensing, public participation in licensing, need-for-power determinations, early site permits, State determinations of site suitability, and the design and operation standards of nuclear power plants.

A wide gamut of ideas for improvement of the regulatory process as well as certain exploratory and more drastic reforms are presented in the Report of the President's Nuclear Safety Oversight Committee (Allison et. al, 1981). The scope of ideas include increasing use of sophisticated risk assessment techniques, reducing unnecessary red tape, remote siting of nuclear plants, resolution of waste management and emergency planning problems, restricting the purview of NRC so as to eliminate non-safety environmental impact issues, and greater attention to quality assurance and operator training. Among the more exploratory changes proposed for consideration are those involving such controversial subjects as subsidies, insurance, utility return on investment, restraining licensing delayers, degrading of alternatives to the nuclear option, and even more drastic "solutions" such as nationalization and regionalization of nuclear or electric power production. The Report notes that it is not certain that any of the latter "paths for exploration" would lead to a feasible proposal for preserving the nuclear option.

CONCLUSION

From the above discussion of causal factors affecting the future course of nuclear power in the United States, it is clear that monumental uncertainties abound and that equally monumental efforts must be made if the nuclear option in this country is to be preserved. The outlook (and the hopes) are summed up in a recent book on Atomic Energy: A New Start by David Lilienthal (1980), who was the first Chairman of the U. S. Atomic Energy Commission:

> "The failures of the present system of nuclear energy need not mark the end of the road. There is still time to change, still time to recapture the perspective and balance and excitement of new ideas that were lost along the way. We cannot afford to perpetuate the errors that we have already made; nor can we afford to abandon the entire effort as a bad job. We need to find a new way in atomic power, and I am certain that we will, in time.
>
> "How much time, no one can say. But time is needed, and patience, and perseverance, and substantial funding. It is still early; we are too near the beginning of the atomic age to make final judgments. The 'new world' is yet to come."

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APPENDIX III

QUESTIONS AND ANSWERS FOR THE RECORD

Department of Energy
Washington, D.C. 20585

February 17, 1982

Honorable Marilyn L. Bouquard
Chairman, Subcommittee on Energy
Research and Production
Committee on Science and Technology
House of Representatives
Washington, DC 20515

Dear Madam Chairman:

It is a pleasure to supplement the record of the December 15 hearing on Nuclear Public Information and Rational Public Policy Decisions with the answers to the additional questions that you submitted on behalf of the Subcommittee in your letter of January 18, 1982. The questions and answers follow in a format appropriate for inclusion in the record.

Question 1. During your testimony before the Subcommittee, you made reference to a number of posters which had been prepared by the Office of Consumer Affairs during the tenure of the previous Administration. Please provide for the record the individual, group, or contractor who prepared each of the cited posters, and the expenditure for the preparation of each poster.

Answer 1. The three posters I used as exhibits at the hearing, the contractors or grantees who prepared them, and the costs are as follows:

Contractor	Subject	Cost
National Council of Churches	Community Energy	$10,000
Tennessee Valley Authority	Integrated Farms	23,000*
Institute for Local Self Reliance	Solar Home Tour	20,000*

* These two sums are the total amounts of the grants or contracts for informational or educational activities. We have no breakout of the amount spent on the posters.

Question 2. On page 7 of your testimony you stated that "In our May 1981 annual report to Congress we itemized information programs for conservation and renewable energy that totaled $200 million for 1980 alone." It appears to me that this report lists expenditures for fiscal years 1979 and 1980 on 73 programs conducted by 14 Federal agencies.

Question 2a. How much was spent in fiscal year 1979 by all Federal agencies in conservation and renewable energy?

Answer 2a. In FY 1979 all agencies spent approximately $140 million on information programs in conservation and renewable energy.

Question 2b. How much was actually spent by the Department of Energy in fiscal years 1979 and 1980 on conservation and renewable energy information programs? What is your estimate of such expenditures in fiscal years 1981 and 1982?

Answer 2b. Expenditures by the Department of Energy on information programs in conservation and renewable energy were $80 million in FY 1979, $135 million in FY 1980, and an estimated $89 million in FY 1981 and $19 million in FY 1982.

Question 2c. During the same time period, how much did the Federal Government in general and the Department of Energy in particular spend on nuclear energy and fossil energy information programs?

Answer 2c. Approximate DOE expenditures for fossil and nuclear energy information programs are as follows:

	1979	1980	1981	1982
Fossil	NA*	$434,000	$ 621,000	$289,000
Nuclear	$226,000	$926,000	$1,068,000	$880,000

* The 1979 information expenditures are not available in existing budget records.

I am unable to provide figures for expenditures by other Federal agencies on information programs in fossil and nuclear. DOE has compiled such information on conservation and renewable energy as required by the National Energy Extension Service Act, P. L. 95-39, Title V.

Question 3. For several years I have been concerned about the Department's accessibility to the press and public on nuclear issues. It is the agency responsible for such major national

programs as developing the breeder reactor and managing the nation's radioactive waste, yet I never see them explaining their programs on television or in the press. How many press conferences or in-depth interviews have you granted since you took office? How many times have you discussed your programs on national television? How many times have you or your staff spoken to groups of state officials, consumers or other organizations to explain your programs and plans? How do you plan to improve this record?

Answer 3 Senior officials in DOE headquarters have appeared on national TV interview programs seven times during calendar year 1981 to discuss a broad range of issues. The Secretary has held four general press conferences with the national news media. Members of DOE's headquarters staff have spoken more than 400 times to groups of state officials, consumers and other organizations to explain our programs and plans.

Because various offices use different criteria in recording meetings, speeches and the topics discussed, any direct comparison by subject matter (such as nuclear and renewable) would be misleading. Nearly 200 of these meetings and speeches in 1981 involved the staff of our office of Conservation and Renewable Energy because many of the projects of that office required direct involvement at the state and local government level. During the current fiscal year many of those projects are being phased out in favor of involvement by the private sector, and the pattern of our informational meetings has now shifted. This is illustrated by the record of media interviews granted at the level of Assistant Secretary and above during the past six months, when Secretary Edwards had his management team in place. Of the 65 interviews granted, seven were by the Assistant Secretary for Nuclear Energy, six by the Assistant Secretary for Fossil Energy, one by the Director of Alcohol Fuels and two by the Assistant Secretary for Defense Programs. The remainder were on the broad issues of energy policy, including the necessity of reversing the decline in the nation's support for the development of nuclear power. Twenty of these interviews were by the Secretary and Deputy Secretary and nearly always included the role of nuclear power in the nation's future.

We expect this pattern to continue and will reinforce it with information programs now being planned to restore balance to the overall DOE informational activities.

Question 4 It seems to me that one of the biggest problems with DOE's nuclear information is that it is written by engineers for engineers. How are you planning to make your technical information more understandable to the general public?

Answer 4 My office is committed to developing materials for the public that are accurate, balanced, and understandable. The Office of Public Affairs has proposed a series of publications on nuclear energy, and we are working with Assistant Secretary Brewer's staff on this project. The proposal includes a completed script on the present and potential role of nuclear energy in providing electricity for the nation. The writer is a recognized authority in the field and is also a first class communicator. We believe these efforts will satisfy your concern about the readability and clarity of texts written on this complex subject.

Sincerely,

Rob

Robert C. Odle, Jr.
Assistant Secretary for
Congressional, Intergovernmental
and Public Affairs